ERIC Document Resume | **See Instruction Sheet** | DATE OF RESUME 8/13/65 | DATE RECEIVED

A. PUBLICATION DATA

1. ERIC NUMBER ED000513

2. ORIGINATOR CONTROL NO(S). 7264

3. IDENTIFICATION NO. N.A.

4. AUTHOR(S): N.A.

5. TITLE OF DOCUMENT ABSTRACTED:

University Research: What it Means to the South

6. PUBLICATION TITLE: N.A.

7. EDITOR(S): N.A.

8. PLACE OF ORIGIN

ORG. SREB

ST. 130 Sixth St. N.W.

CITY, STATE Atlanta, Georgia

TELE. EXT.

INST/LOC CODE

9. PUBLISHER OR SOURCE

Southern Regional Education Board

10. VOL.	11. PAGES	12. MO./YR.	13. TOTAL PP.
N.A.	N.A.	59	33

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TYPE OF REPORT
PROPOSAL ☐
IN-PROGRESS ☐
FINAL ☒
FOLLOW-UP ☐

OTHER ERIC REFERENCES:

ERIC SATELLITE CODE

B. INDEXING DATA

14. SUBJECT AREA

15. TYPE OF ENDEAVOR Report

16. INDEXING TERMS (6-12)

research

17. ABSTRACT (MAX. 250 WORDS)

Implications of various types of research in southern institutions. Notes that such research serves many purposes and has many byproducts—it means dollars for people, good management, exploring our cultural heritage, controlling nature, serving mankind, preventing and solving problems, great universities, healthy people, saving lives, a vigorous economy, wider horizons, and learning.

ERIC No.

18. SOURCE OF ABSTRACT

C. FUNDING DATA

19. SUPPORTING ORGANIZATION

20. DIVISION OR DEPT.

21. CONTRACT NO.

PROJECT NO.

22. TOTAL COST OF PROJECT

23. DURATION OR PROJECT

U.S. Department of Health, Education, and Welfare Office of Education

ERIC Form 1

Section 1

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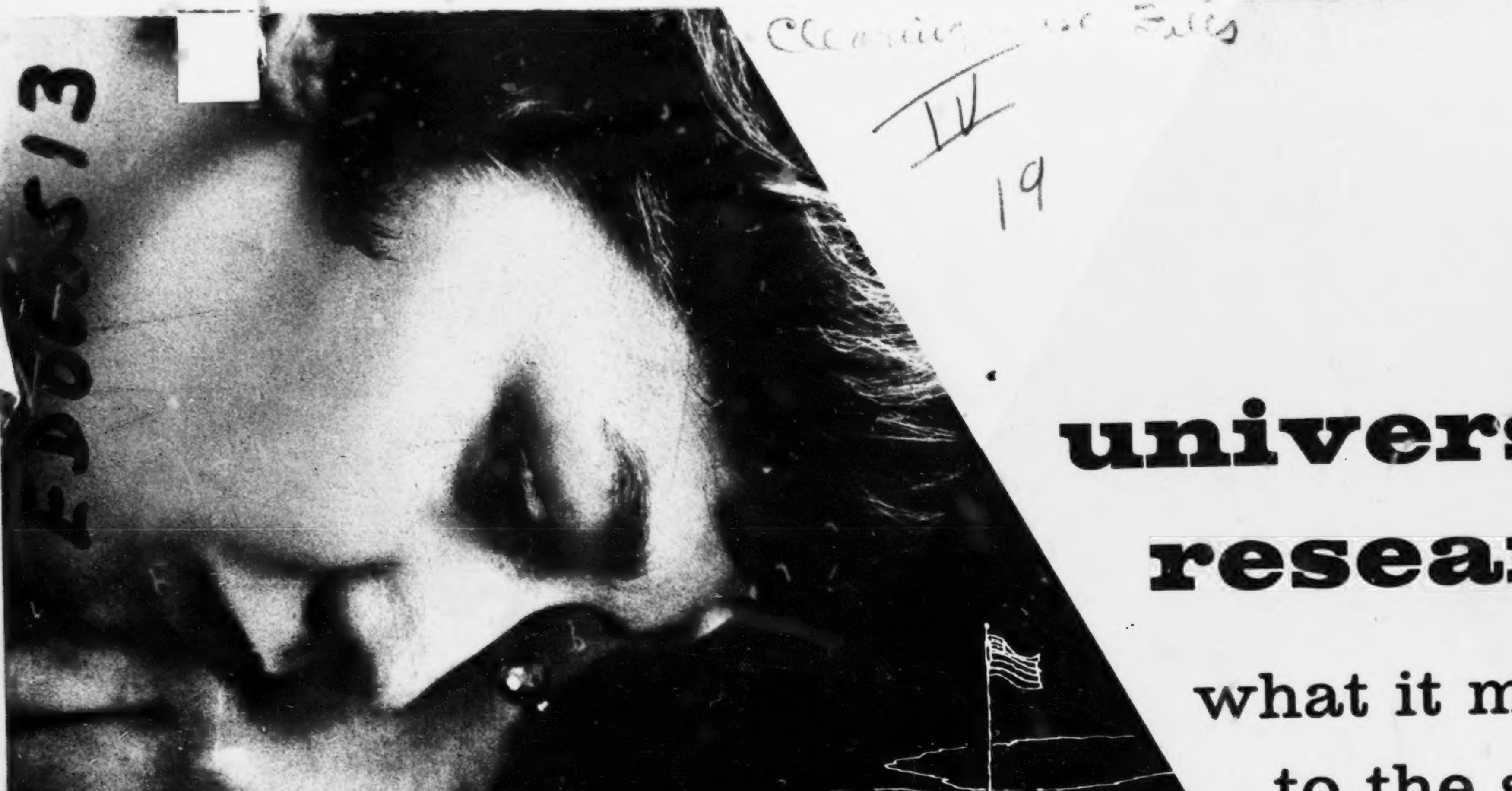

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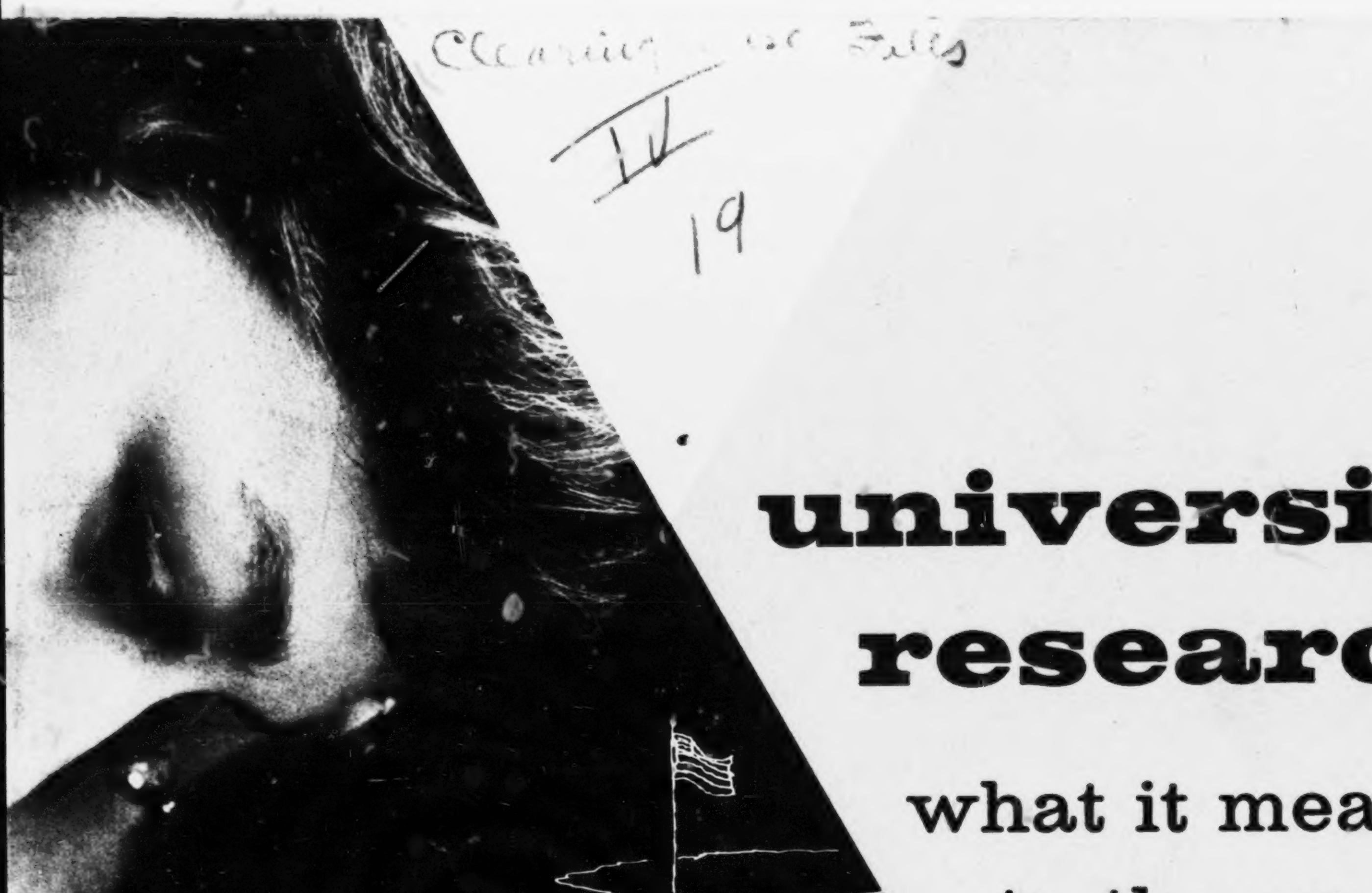

university research

what it means to the south

southern regional
education
board

Section 1

CECIL H. UNDERWOOD
Chairman, SREB

WHERE there is no vision the people perish.

This axiom is as true today as it was in King Solomon's time, except that twentieth century man's vision often requires the help of an electronic microscope or a 200-inch telescope.

Vision—research—means looking to the future through open eyes and inquiring minds. But there are many facets of the future on which modern man can focus. This "sampler" of research at Southern institutions is intended to illustrate some of them, and to show how vital university research is to the well-being of our region.

The research depicted here was chosen to help answer two central questions: What does research mean to the region? How does it help light up the path to a better future?

The diversity of these research samples should inspire pride of achievement. Since research affects us all, we must see that all important fields of inquiry receive sufficient attention.

Naturally enough, for most research specialists, no projects are more important than their own. Our task, then, is to keep informed about all the many kinds of contemporary research and to be responsible for keeping a proper balance.

Research requires balanced support. Federal research activities must be supplemented by agencies closer to home which reflect local interests and needs.

As guardians of research we have another responsibility—to make sure we are prepared to cope with the growing pains of progress which are often a by-product of research. For example, if research leads us to greater productivity and this in turn brings about more leisure, it is the responsibility of research to help us use this leisure wisely, lest we create insurmountable social problems.

Looking at this research sampler, you will be impressed by the way our Southern institutions are moving toward both breadth and balance in their research programs. You will notice some facts and figures showing financial support of research in the nation and region. These statistics are crucial, for if they grow, we will grow with them. If they diminish, so will our vision.

And where there is no vision the people perish.

Cecil H Underwood

GOVERNOR CECIL H. UNDERWOOD OF WEST VIRGINIA
CHAIRMAN, SOUTHERN REGIONAL EDUCATION BOARD

U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
Office of Education
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Section 2

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Section 1

THREE EXPECTANT YOUNG FACES in a dilapidated, one-room school house. This is not a typical scene in the South any more, but it does serve to remind us how far we've come and how far we still have to go.

It is comforting to note that we are well on the way. These expectant faces reflect the optimism of an entire region. The children pictured here have more to hope for than their parents did, partly because of the research projects conducted by Southern universities. A team of university researchers is working right now to release the human and economic potential locked up in the Appalachian Mountain area where they live. (See page 13.)

Doubtless these children, and generations after them, will also be affected by almost every one of the other research projects at Southern institutions described in the following pages. Progress cannot be confined to one field or one place. It is a contagion which spreads to other aspects of living, other areas, and other people who have almost no direct contact with it.

Since the impact of most research projects is felt in all corners of the scientific world, the chapters of this booklet should not be thought of as fenced-off areas of research. There is unity in knowledge even if there is diversity in research, and chapter headings cannot confine new ideas.

The following is a panorama of university research, illustrating that research serves many purposes and has many by-products besides its primary goal of getting closer to the specific answers it seeks.

Section 2

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research means ···

dollars for people
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Section 1

research means dollars for peopl

RESEARCH ALWAYS PAYS OFF in knowledge, even if it's only the knowledge that we still don't know or that we're on the wrong track. It usually pays off in money, too, although this is often a secondary consideration in cases where lives are saved or living is made easier and more productive.

However, there are numerous examples of research whose results can be translated directly into dollars and cents. In many cases the pay-off is overwhelmingly larger th
research efforts.

For example, back in the early
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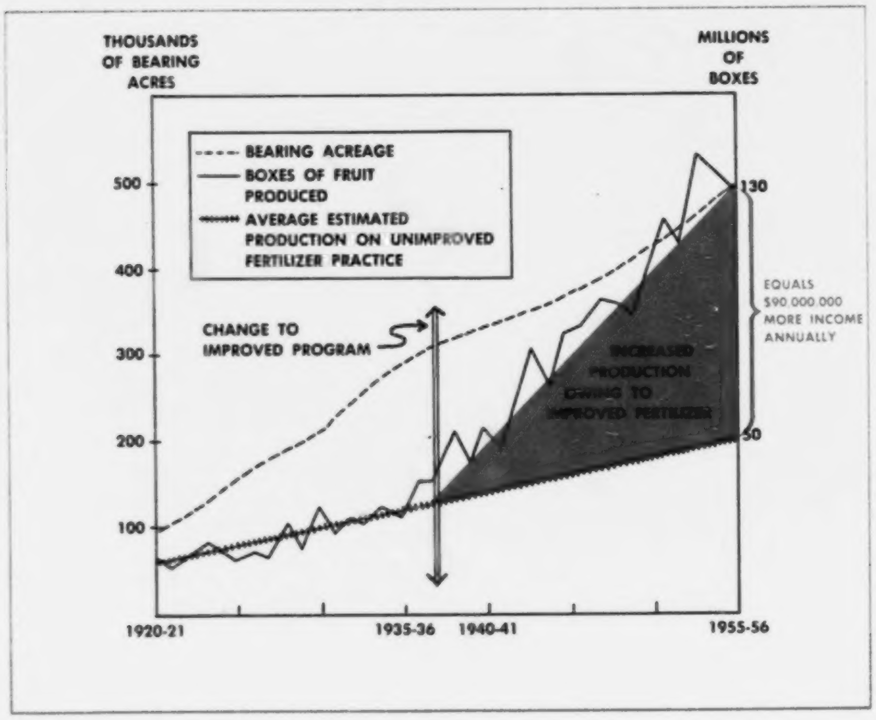
Citrus fruit production, before and after a research breakthrough



Hybrid sorghum, worth 23 million

Section 2

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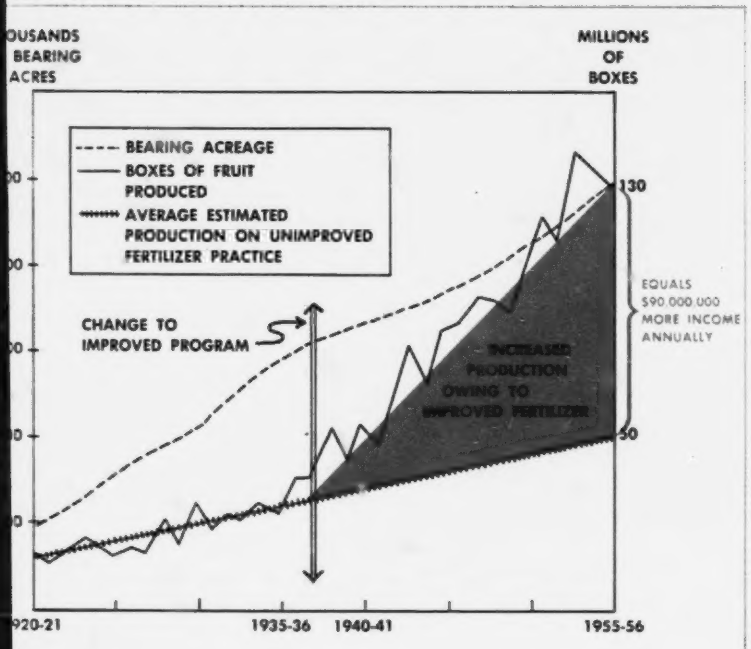

For example, back in the early 1930's, the University of Florida Citrus Station was doing some basic research for about the same reason that people climb Mt. Everest: because it's there.

The citrus growers were doing all right—considering the depression. Their oranges were growing well enough with the help of the kinds of fertilizers they had.

But the people at the citrus experiment station kept on with their research just the same, until their painstaking work revealed that adding magnesium, manganese, zinc and copper to the soil would produce more oranges. So a few growers began to try out this new method.

By 1937, the use of these elements in fertilizer was becoming standard procedure in Florida. The rest of the story is best told by the chart. It shows that before 1937, the more acreage a man had the more oranges he produced. But after 1937 a dramatic change took place—the chart shows a sharp increase of fruit production per acre.

The director of the University of Florida Experiment Station has figured out how this increased production affects the citrus growers. In round numbers, the difference in profits between the previous fertilizing system and the new one amounted to more than 90 million

Hybrid sorghum, worth 23 million dollars more than last year's crop

Section 1

dollars annually at last count. This is three times as much income to Florida each year as all the revenue funds ever appropriated for the operation of the Florida Agricultural Experiment Station in its entire history.

▼

Since the early 1920's, researchers at Texas A & M have been working on hybrids in an attempt to come up with a better grain sorghum. The answer was a new breeding technique introduced to seed growers in 1953 for testing purposes.

The results? A yield of 25-40 percent more grain per acre. Last year's 270 million bushel crop was worth 23 million dollars more than the preceding year's crop.

The Texas A & M Experiment Station estimates that for each dollar spent on sorghum research in the last five years, the high yield from the new hybrids has returned 80 dollars to the Texas economy, even if only half the increase is credited to the new plant.

▼

At the University of North Carolina's Fisheries Institute, research has uncovered techniques for oyster rehabilitation and has produced changes in shrimp fishing regulations, to name only two projects of the 10-year-old institute. Its program of conservation and development of natural resources has been a boon to those who make their living from the sea.

The changes in shrimp fishing regulations alone have increased the income of North Carolina shrimp fishermen by at least four million dollars over the past eight years.

Because of research at Texas A & M, uninvited "trash fish" caug
nets can now be made into a good fish dinner instead of being th

Section 2

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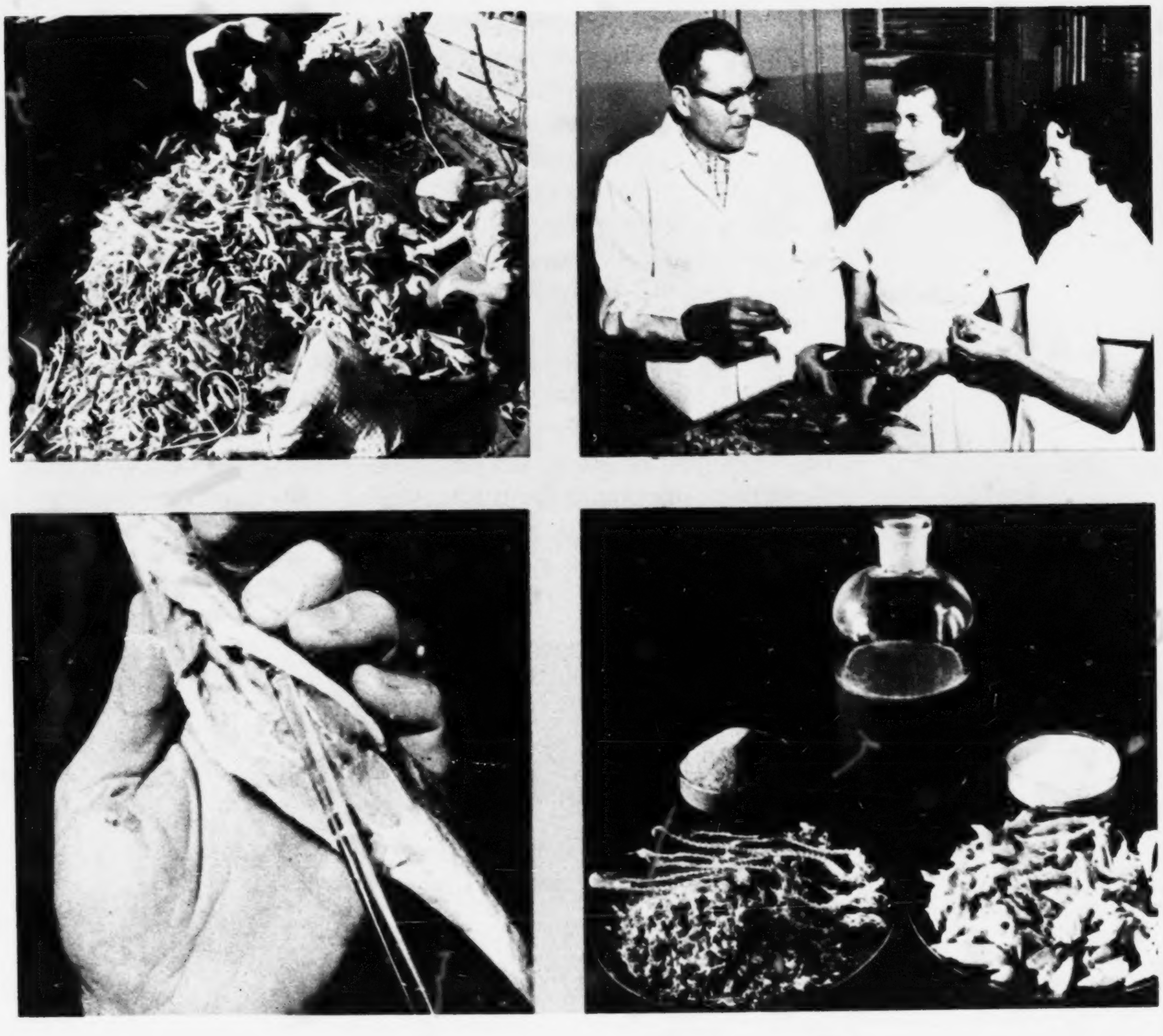
Because of research at Texas A & M, uninvited "trash fish" caught in shrimp nets can now be made into a good fish dinner instead of being thrown away



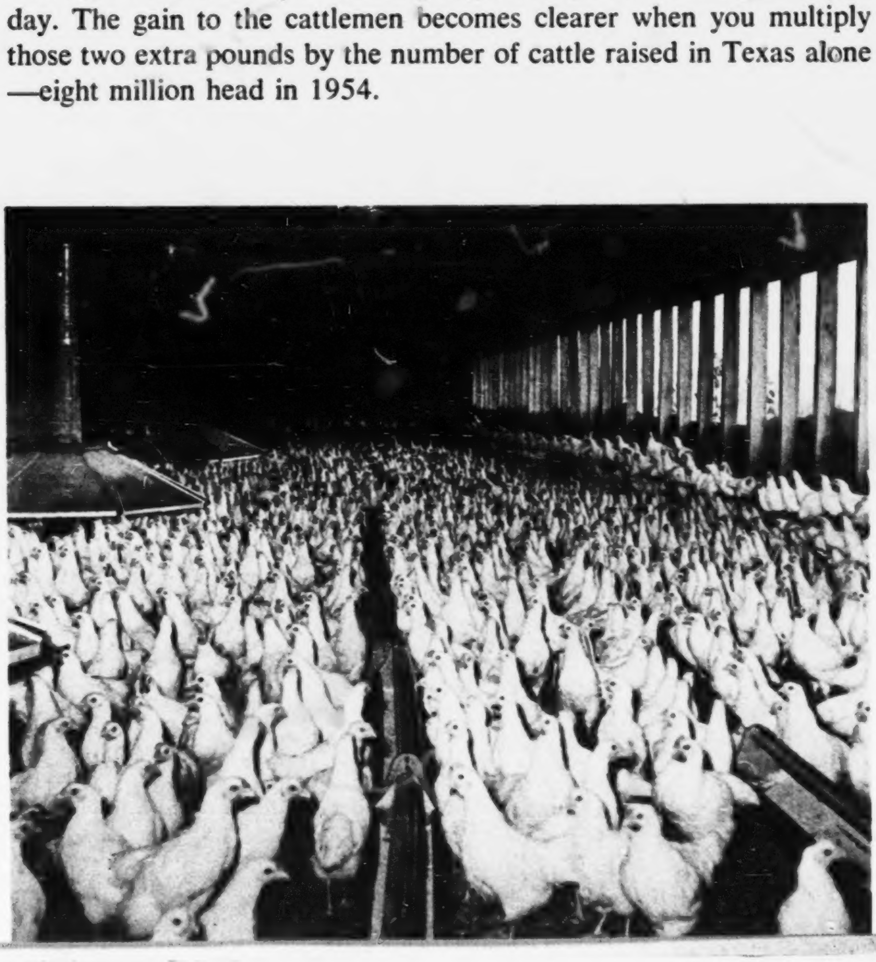
Section 1

research means **good management**

COMMON SENSE has always been an ingredient of good management, but today's businessman tests his hunches with research. In the upland country west of the Pecos, Texas cattle breeders had a hunch that cattle which gained weight quickly might transmit this characteristic to their offspring. If this were true, they reasoned, it should be possible to breed cattle for rapid growth.

That was in 1942. By 1954, scientific experiments at Texas A & M on more than 3,500 animals showed that not only was their hunch correct, but the fast-gaining cattle required less feed per pound of saleable meat.

The strains of high-gaining cows and bulls which were produced gained slightly over three pounds per day (and produced fast-gaining calves), while ordinary cattle might gain only about one pound per day. The gain to the cattlemen becomes clearer when you multiply those two extra pounds by the number of cattle raised in Texas alone—eight million head in 1954.



Research takes the guesswork out of broiler raising

Cattle production is becoming
equipment for a wide range of tests
produced per pound of feed, weight
high and low priced cuts per carcas
of the meat as well as vitamin reter

Sheep, too, have been fattened u
have produced fast-gaining lambs–
longer.

The rancher? He's glad to see
scientific methods because he know

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Good management is especially
because it operates on such a nar
breed, age, or general quality can
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makes a broiler marketable now o
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This is where economics, statistic
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Section 2

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Cattle production is becoming a systematic procedure requiring equipment for a wide range of tests: the rate of gain in pounds, beef produced per pound of feed, weight of marketable carcass, percent of high and low priced cuts per carcass, tenderness, juiciness and flavor of the meat as well as vitamin retention.

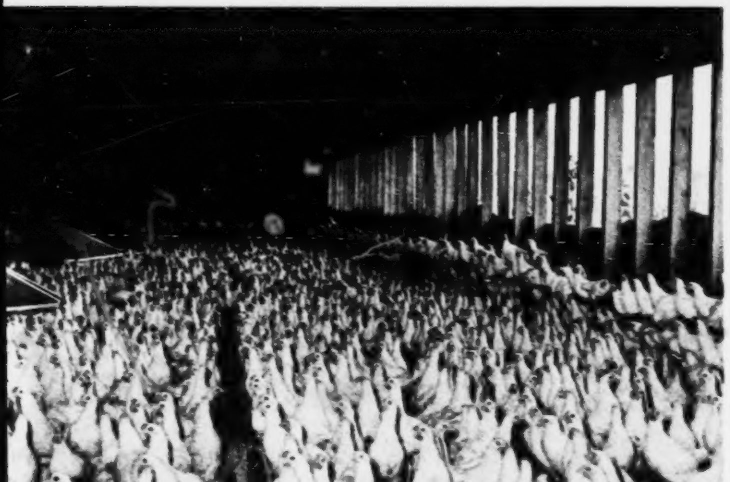
Sheep, too, have been fattened up by research. Fast-gaining rams have produced fast-gaining lambs—and their wool is half an inch longer.

The rancher? He's glad to see the guesswork being replaced by scientific methods because he knows it adds up to good profits.

▼

Good management is especially important in the broiler industry because it operates on such a narrow margin. Small differences in breed, age, or general quality can make large differences when the broiler goes to market. Men in the poultry industry must know what makes a broiler marketable now or tomorrow, in a neighboring city or a far-away state.

This is where economics, statistics and business administration enter in. Researchers at the University of Delaware have been taking a scientific look at the factors which affect prices received for broilers. Their project directly affected broiler production in Shelbyville, Delaware but also applies to related industries which are looking to research for clues to good management.



Research takes the guess-work out of broiler raising

Section 1

Automation has even come to the watermelon. At Mississippi State University, agricultural economists have fathomed the secrets of watermelon marketing with the help of an electronic computer. A few years ago, even the most experienced man in this industry would not have been able to predict the fate of 17,018 car lots of Mississippi watermelons shipped from 28 producing areas to 22 major U. S. markets. But the computer at Mississippi State carried out the 200 million arithmetical operations involved in pinpointing the most profitable markets for every area and the volume to be shipped to each. Put into practice, these findings would increase income about half a million dollars.

◆

For years, common sense has dictated that "the customer is always right." Researchers have acknowledged this but are carrying the adage a step further to see just what it is the customer wants so that management can comply.

At the University of Tulsa's newly-established petroleum marketing department (co-sponsored by leading oil companies), motorists' buying habits in retail service stations have been scrutinized. What do motorists like and dislike in filling station service? What are the operators and employees doing to satisfy the wants of their customers? And finally, what kind of education, experience, training, income, and attitudes do these "driveway salesmen" have?

Oil companies throughout the United States and Canada have already requested thousands of copies of the results of this study—another indication that research has found a permanent place in business operations.

Fast-gaining cattle, fattened up

Science has even come to the

Section 2

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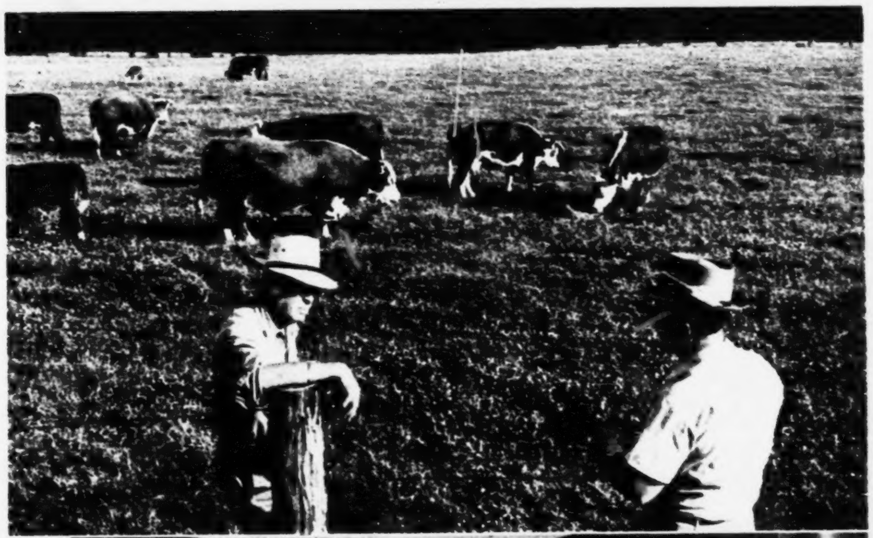

Science has even come to the watermelon

Section 1

research means **exploring our cultura**

OUR CULTURAL HERITAGE is the foundation of experience upon which we build our present and our future worlds. Our studies of the past often give us new insight and knowledge about the present.

Perhaps this is why the Institute of Community Development at the University of Oklahoma has contributed to the restoration of an Indian village, or why archaeologists from Tulane University are so patiently unearthing a 20-square-mile city established in 2000 B.C.—almost 4,000 years ago.

The city, called Dzibilchaltun, is in the Yucatan Peninsula and was still occupied when the Spaniards arrived some 500 years ago. A four-year contract with the Mexican government is permitting the removal of tons of rubble so as to reveal the buried architecture of these ancient peoples. Meanwhile, divers are plunging 144 feet into the sink hole from which these people drew water in order to recover fragments of the Mayan culture.

What do archaeologists expect to learn from these relics? For one thing, they hope to find out why such a people should fail to survive —what in their culture contributed to their downfall?

There are also some more specific questions in the minds of the Tulane researchers—how did these primitive people, without metal, without domesticated animals, without the wheel, manage to move 50-ton stones through rugged Yucatan jungles to build their massive temples?

▼

At Texas Tech, a historian and an anthropologist are also digging into the rich soil of our past in order to turn up new knowledge about our cultural roots. The subject of this inquiry is the Comanche Indian who has had such a great influence on the history and culture of the Southwest. In fact, the study was initiated because the Texas Tech

Remains of a Mayan civilization 4,000

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Remains of a Mayan civilization 4,000 years old are salvaged by a diver

A book, *The Comanches,* which grew out of the study is a significant contribution to the history, ethnology and sociology of the Southwest. It describes why and how the Anglo-Americans succeeded in conquering the region while the Spanish and French did not, and how a people with a very meager material culture could contribute significantly to a richer culture.

The book also discusses why people living adjacent to the Comanches developed certain characteristics. Is it true, for example, that

Section 1

the aggressiveness and individualism of the present day Southwest population may be attributed to their long struggles against the indomitable Comanches?

▼

But appreciating our cultural heritage does not always involve digging with pick and shovel. Many of our greatest cultural achievements are already at hand, waiting to be seen and studied.

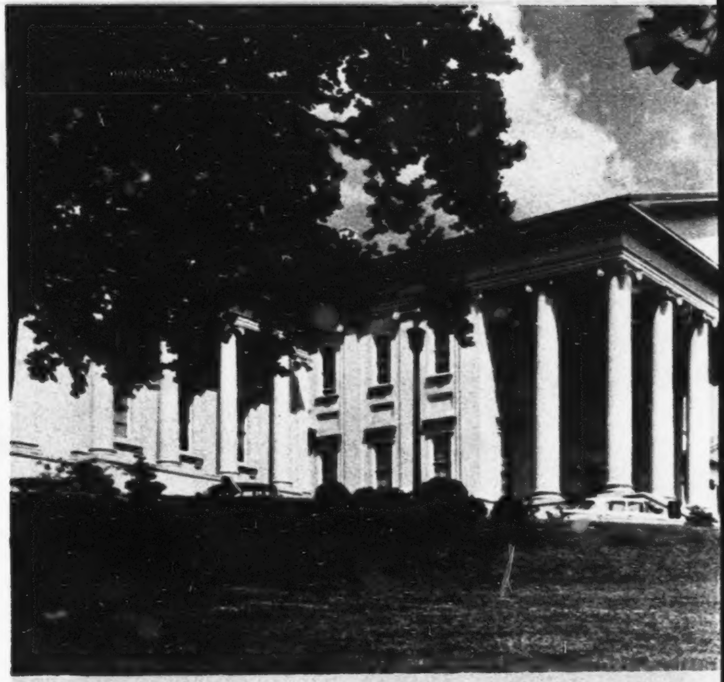
The problem here is largely one of accessibility, since relics of the past are in hundreds of different locations throughout our own country and the rest of the world.

Realizing this difficulty, participants in a project sponsored by the Carnegie Foundation have selected and organized into 18 categories, 2,500 color slides of American architecture, painting, sculpture, furniture and technology. This collection of visual materials, organized at the University of Georgia, is used to teach American cultural development. Ten of these sets have already been allocated for free distribution to institutions throughout the country so that their effectiveness as a teaching aid may be tested, and another set of 1,500 items is being lent to smaller institutions.

▼

Of course, the bulk of our history is recorded in writing. Recently much of that writing has been devoted to the War Between the States which will mark its 100th anniversary soon. A great deal of this historical research and writing is taking place in Southern universities.

Not long ago, the editorship of the *Journal of Southern History* was assumed by scholars at Rice Institute which has attracted a great deal of attention recently for its contributions to the field of American history.



The Virginia State Capitol, designed by Thomas Jefferso is pictured in one of a set of 2,500 color slides of Ameri for teaching

The Comanche Indian's villages and battles are brought t by modern historians

Section 2

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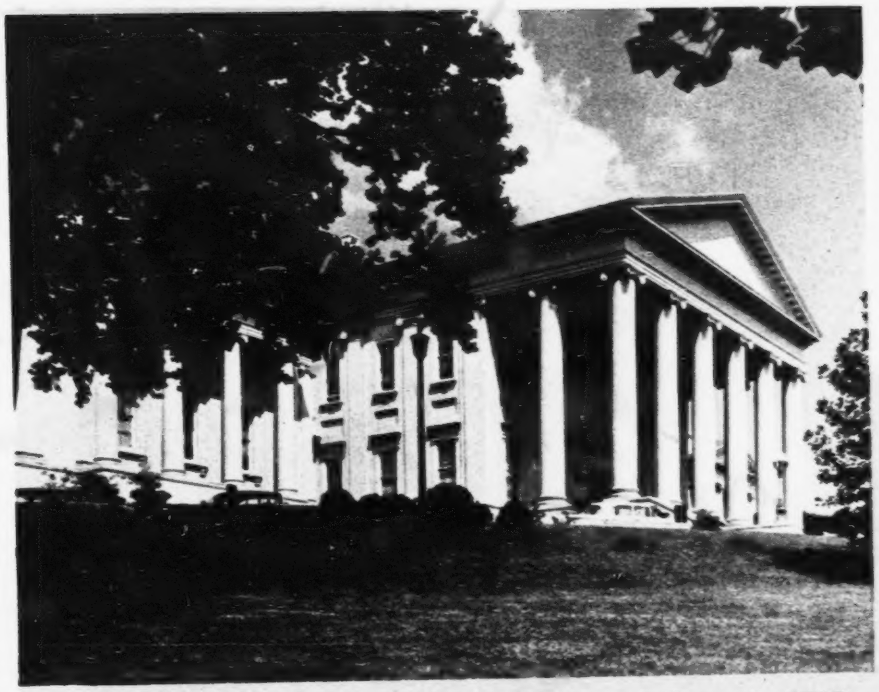

The Virginia State Capitol, designed by Thomas Jefferson in 1785, is pictured in one of a set of 2,500 color slides of Americana used for teaching

The Comanche Indian's villages and battles are brought to life again by modern historians

Section 1

research means **controlling nature**

IN THE BIBLE, man is given "domin
"over every living thing that mov
herb yielding seed." Throughout h
animals to work for him, but only
them to suit his needs.

In 1949, a geneticist at North
pounds of peanuts to Oak Ridge t
units of radiation (500 units are su
on the peanuts was primarily tha
properties, since about 11,000 mut

When these peanuts were planted
combinations of favorable and unfa
fied by patient observation of man
found that the prettiest plant was n
the most hardy might bear the smal

A peanut with a combination of
already evolved by conventional br
christened the N. C. 2. Today, 75%
Carolina are type N. C. 2, boosting t
per acre. This profit translates into
dollars a year.

Now, as a result of irradiation r
College, peanut N. C. 4x has been
planting in 1960. It combines the
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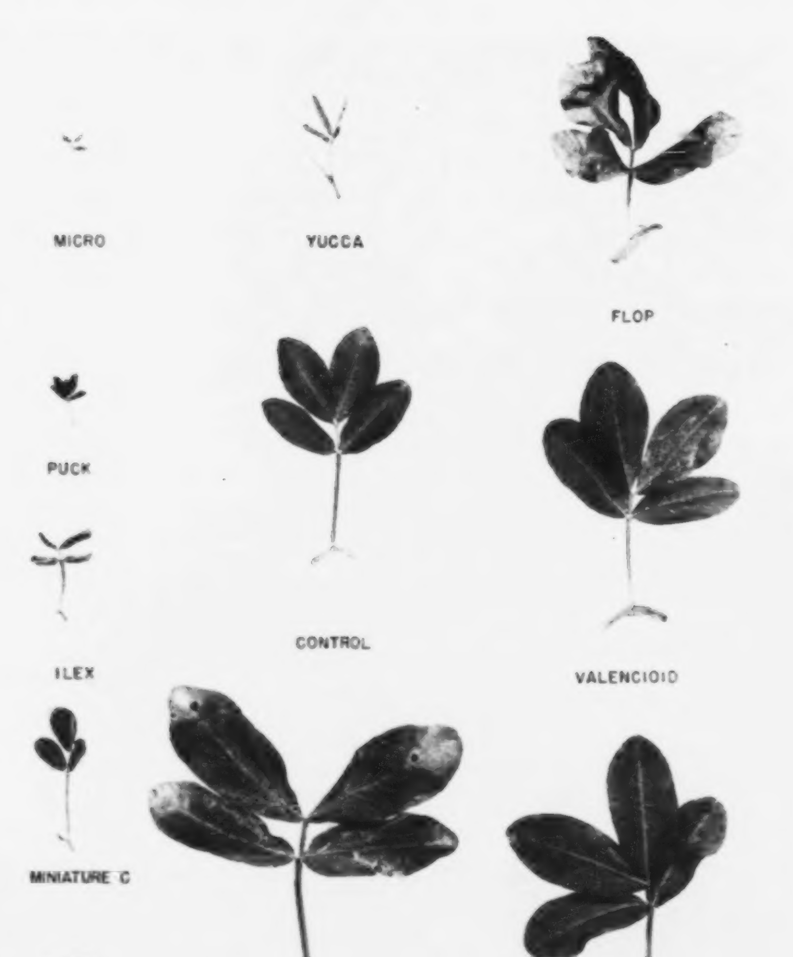

Irradiation causes some surprising innovations i

Section 2

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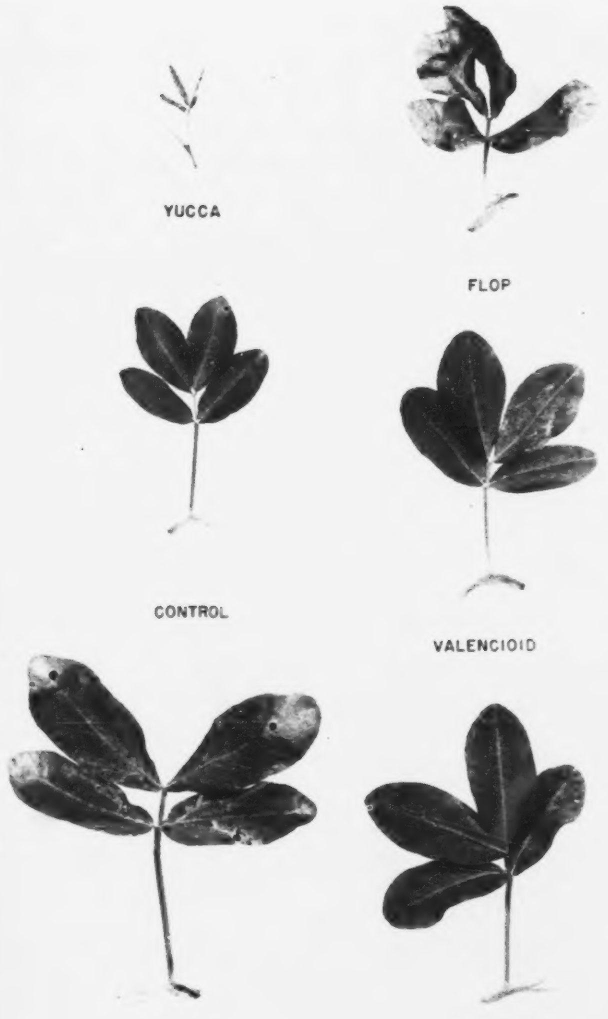

IN THE BIBLE, man is given "dominion over the fish of the sea," and "over every living thing that moveth upon the earth" and "every herb yielding seed." Throughout history, man has put plants and animals to work for him, but only recently has he begun to remake them to suit his needs.

In 1949, a geneticist at North Carolina State College took 50 pounds of peanuts to Oak Ridge to have them subjected to 18,500 units of radiation (500 units are sufficient to kill a man). The effect on the peanuts was primarily that of re-shuffling their hereditary properties, since about 11,000 mutations were produced.

When these peanuts were planted, the new sprouts had numerous combinations of favorable and unfavorable traits which were identified by patient observation of many plant generations. Investigators found that the prettiest plant was not necessarily most hardy, while the most hardy might bear the smallest fruit.

A peanut with a combination of many superior characteristics had already evolved by conventional breeding methods in 1954 and was christened the N. C. 2. Today, 75% of the peanuts grown in North Carolina are type N. C. 2, boosting the growers' income by 73 dollars per acre. This profit translates into an added income of ten million dollars a year.

Now, as a result of irradiation research at North Carolina State College, peanut N. C. 4x has been created and made available for planting in 1960. It combines the heavy yield of the N. C. 2 with several new advantages: thicker hulls, fewer damaged kernels, fewer growth cracks and greater resistance to leaf spot. This is the first improvement of a living thing by atomic research in the United States.

Irradiation causes some surprising innovations in an ordinary peanut plant (center)

Section 1

Man's dominion over all living things often brings about complications. When a one-and-a-half billion dollar atomic installation was constructed on a 315-square-mile tract along the Savannah River, the Atomic Energy Commission recognized that this would have serious effects on the natural life of the area.

For this reason, the University of Georgia and the University of South Carolina were asked to study the plants and wild life in the area in 1951. They observed first-hand the effect of the Savannah River Project on nature's delicate balance of plants and animals, and kept a wary eye out for signs of river pollution which would affect all forms of life including man.

During the past eight years, a vast array of facts has been recorded by biologists and others at the universities which will provide sources of inquiry for scientists for many years to come.

They have already noticed, for example, that the large quantities of hot water discharged into the creeks drive away fish but, at the same time, the warmer water further downstream provides a Florida climate which increases fish food and makes fish multiply. Knowledge of these changing conditions will be useful to a wide range of people.

▼

In order to use the oil nature stores underground, man has first to locate it and then—often harder—to bring it to the surface. This process of oil recovery requires constant research into ways of coaxing the precious black gold out of the ground.

Research engineers have discovered that more oil is yet to be recovered in Texas alone than has been produced in the United States since the first oil well was brought in at Titusville, Pennsylvania 100 years ago.

The effects of man's intrusion on Nature are studied at the site
installation

Cities and towns across Texas depend on oil for their l
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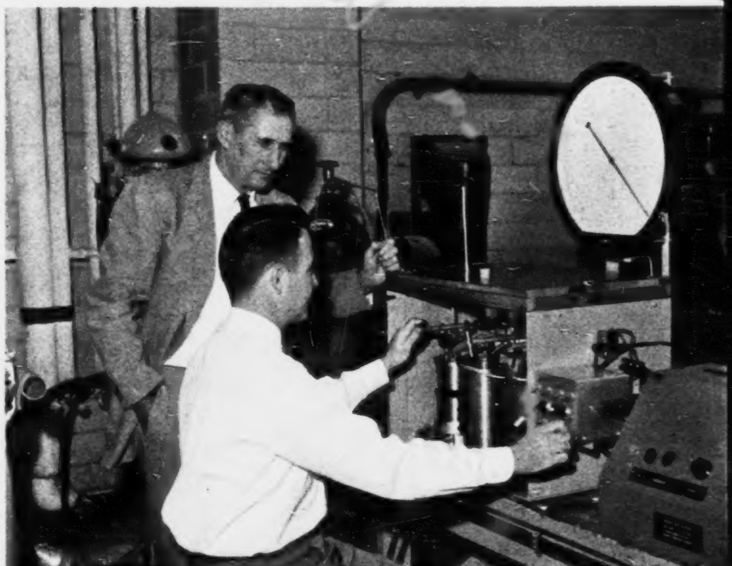

Section 2

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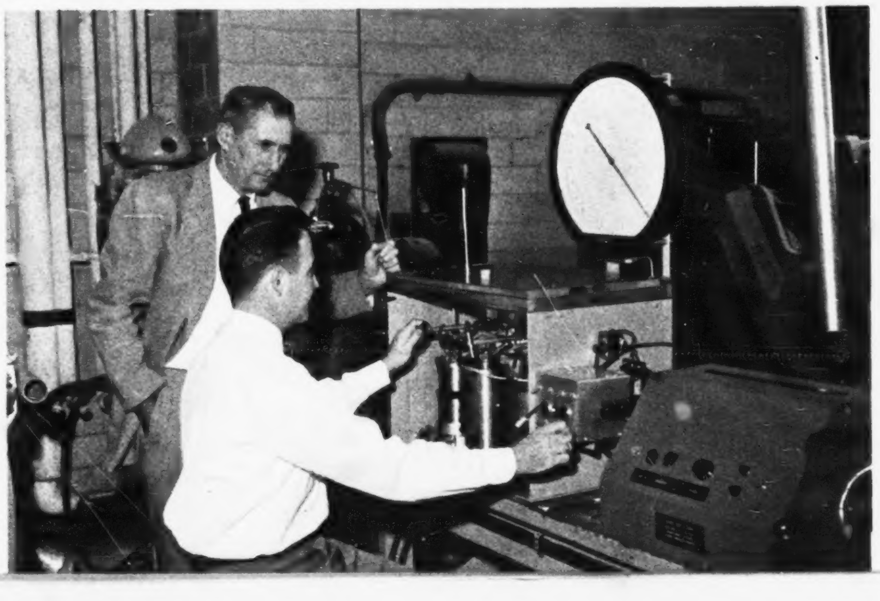
The effects of man's intrusion on Nature are studied at the site of an atomic installation

Cities and towns across Texas depend on oil for their livelihood. If oil cannot be brought out of the ground, these oil towns are in danger of becoming ghost towns. One job of the petroleum engineers at the University of Texas is to predict whether oil in a certain location will continue to provide a living for a town 25 years from now. Meanwhile, they work on the immediate problem of bringing the reluctant oil to the surface.

Engineers find that locating oil is often less difficult than coaxing it out of the ground



Section 1.

research means **serving mankin**

CURIOSITY may be the outstanding characteristic of the scientist, but he has another characteristic which goes far beyond that: the desire to make this a better world for everyone living in it, and those yet unborn.

This is a form of responsibility—a desire to share ideas and knowledge with others to help them help themselves.

At Louisiana State University, for example, two distinguished parasitologists have been concerned for some time with finding ways of killing worms which are harmful to man. Although parasitic worms are no longer the serious health problem they once were in the South, they do infest a good half of the world's population, and there are no boundary lines in a scientist's domain.

The only way some parasitic worms can be controlled is by treating an entire community at once. The L.S.U. scientists have succeeded in perfecting a compound called Dithiazanine which can be administered to a whole village, destroying four of the five major parasites. The fifth one—if he happens to be present—will also be given a major setback.

Testing of the drug was done at a training school for the mentally retarded in Louisiana. The administrators were helping themselves by helping someone else because worms had been a recurring problem at the school. Further testing on more severe cases was done in Costa Rica. The outcome was proof that the drug was the first to be effective against several types of parasites.

Since these parasitic diseases caused by worms are chronic, they are capable of sapping the strength of a whole population. The control of the worms through Dithiazanine was therefore welcome news to many underdeveloped areas which have sent delegations of public health officers to L.S.U. from all four corners of the world.

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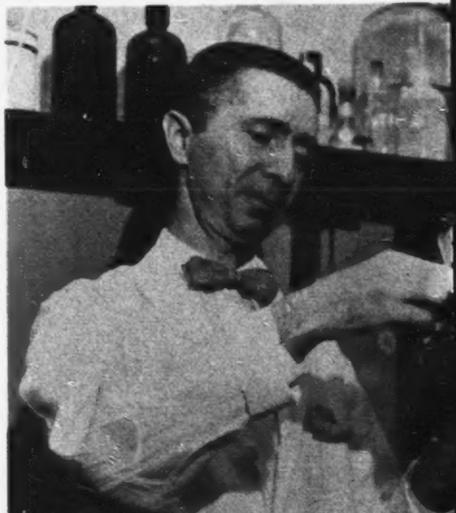

Parasitic worms—harmless in a jar, but a menace to half the world's population

Section 2

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Underdeveloped regions in our own country have received attention from scientists at Southern colleges and universities. One team of social scientists is studying the needs of people in the picturesque but poor Appalachian area.

While the hills are a problem to the mountain people, they are also a promise because they have all the resources of an American Switzerland—resources which are not being used.

To find out why, and to change the picture, the major religious denominations of the South have marshalled sponsorship for research designed to accumulate knowledge and insight into the conditions prevailing in 190 counties of the Appalachian area.

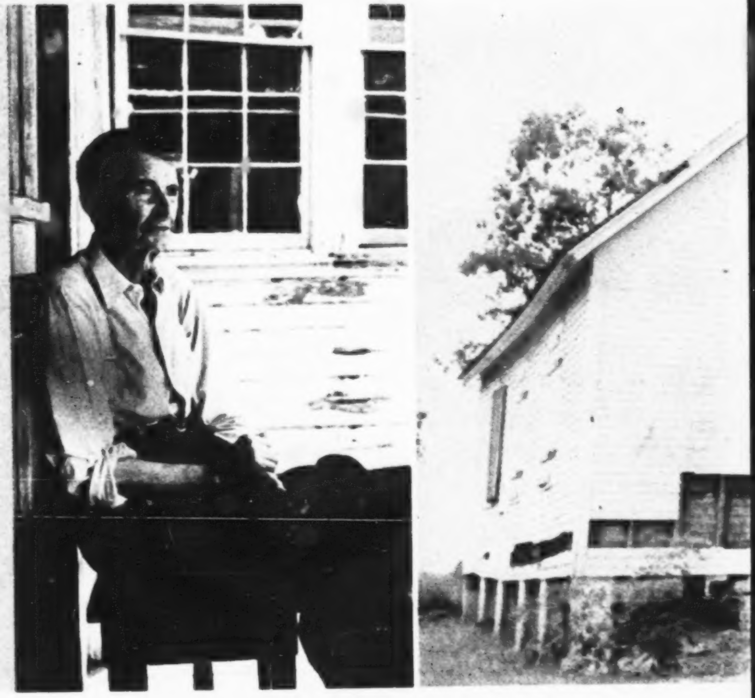
With headquarters at Berea College, the team of researchers is mapping changes which have taken place, determining the needs of the people, defining the contributions which must be made by social agencies, studying attitudes toward industrialization, and examining the influence of local customs on the religion and education of the people. Teamwork is a significant aspect of this project. The University of Kentucky, which provides a director of general research and research personnel, is only one of the 11 institutions that have divided the responsibility among themselves.

A more intensive study of 17 out of the 190 counties plus three cities will focus directly on the part which organized religion can have

Parasitic worms—harmless in a jar, but a menace to half the world's population

Section 1

A cell bank—raw materials for research throughout the United States and other countries



Trademark of the Appalachians—sturdy men but not-so-sturdy schools

in rehabilitating the area. Next year, with complete data in hand, a comprehensive program for the future of the region will be developed by church leaders, educators, and health and social agencies.

▼

In this way, researchers are sharing responsibility with church leaders for forming a better world. Researchers also work with legislators to bring about needed reforms, as they did in Mississippi.

The state had a reputation for supporting "marriage mills" for persons who were too young to marry legally elsewhere. New laws were urgently needed to do away with this moral blight.

With the help of facts and figures and other technical assistance provided by the Bureau of Public Administration at the University of Mississippi, the legislature succeeded in passing a new marriage law in 1957.

During the first year after passage of the law, there has been an estimated 70% reduction in the number of marriage licenses issued, probably a 70% reduction in heartbreak and social problems.

Tuskegee Institute's Carver Foundation is helping to
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Cultures of cells and tissues are very much in demand
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A few years ago, the tissue culture laboratory at T
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Sponsored by the National Cancer Institute of the N
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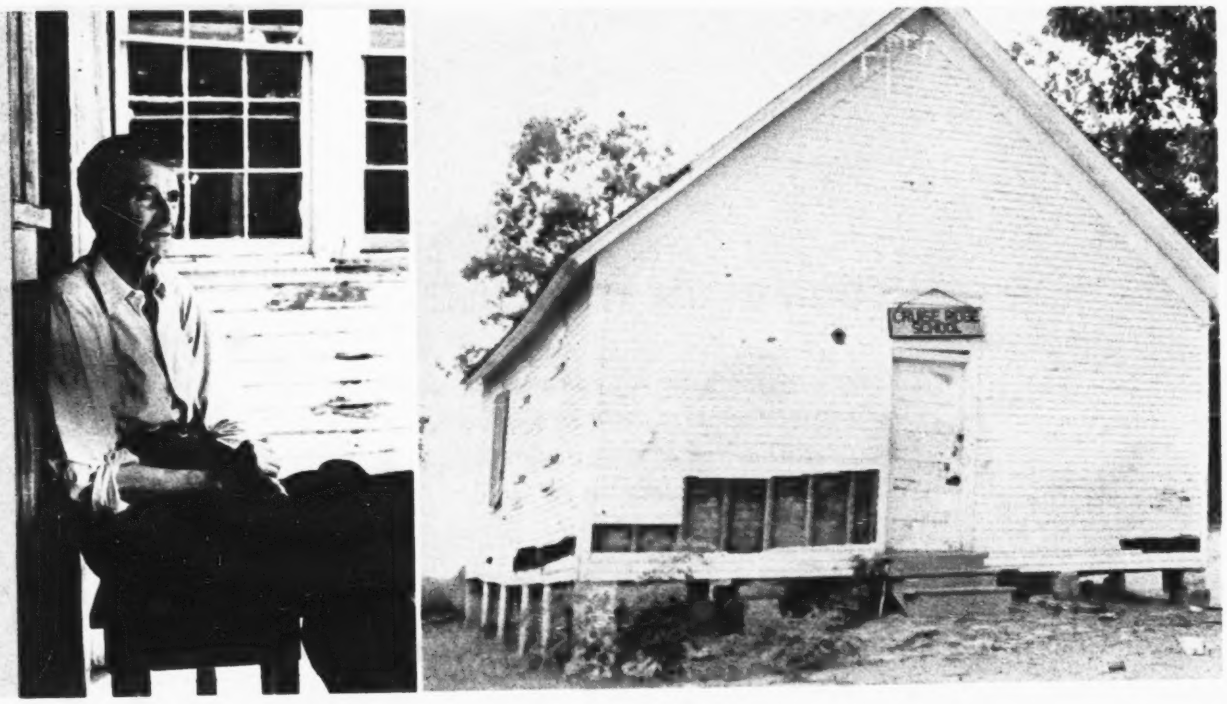
Section 2

A cell bank—raw materials for research throughout the United States and other countries



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Tuskegee Institute's Carver Foundation is helping to reduce the pain and heartbreak of disease on a world-wide basis. Through the establishment of a cell bank, it is making available research material to every laboratory in the United States and foreign countries.

Cultures of cells and tissues are very much in demand by scientists for experiments designed to reveal the mysteries of a cell and of the whole life process. These fundamental cell studies are giving us clues to the understanding of cancer and other diseases. Cell studies have helped in the discovery of the Salk vaccine and many recent developments in the study of virus diseases.

A few years ago, the tissue culture laboratory at Tuskegee Institute had the distinction of being the first to mass-produce cultures of cells used in the field trial of the Salk vaccine. The development of the Institute's mammalian cell repository was an outgrowth of this venture.

Sponsored by the National Cancer Institute of the National Institutes of Health, the cell repository presently includes nearly 50 types of cells and serves as a primary source of cells for reference purposes or for research.

Section 1

research means **preventing problems**

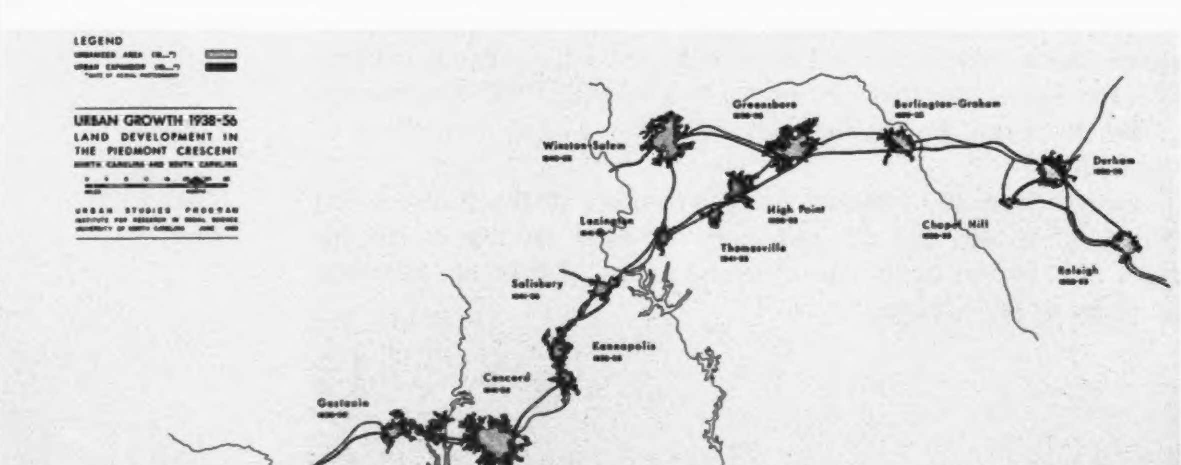
ONE OF THE BEST WAYS to avoid trouble is to anticipate it so that you can either prevent it or brace yourself for its arrival. Researchers adopted this line of reasoning long ago, realizing that thinking ahead—looking for trouble, so to speak—is much superior to patching up problems after they arise.

Changes of all kinds are especially likely to bring future difficulties, and nothing is changing so fast as the way our population is going to town. First of all, we're growing. In 15 years we will need homes, schools, hospitals, stores, transportation and other facilities for 50 million more people—and a great majority of these people will live in cities.

Fifteen years ago, about 58% of us lived in cities. Fifteen years from today, nearly 80% of us will live in cities.

Some other facts are worth noting. Each year suburbs sprawl farther into the countryside. Right now we are bulldozing farms and forests into streets and lots at the rate of one million acres a year—3,000 acres a day!

And today we have over 50 million cars. By 1975, we may well have 88 million cars on streets laid out for horse-drawn buggies and already clogged with our present number of vehicles.


LEGEND
URBANIZED AREA
URBAN EXPANSION
URBAN GROWTH 1938-56
LAND DEVELOPMENT IN THE PIEDMONT CRESCENT
NORTH CAROLINA AND SOUTH CAROLINA
URBAN STUDIES PROGRAM
INSTITUTE FOR RESEARCH IN SOCIAL SCIENCE
UNIVERSITY OF NORTH CAROLINA
Winston-Salem
Greensboro
Burlington-Graham
Durham
High Point
Lexington
Thomasville
Chapel Hill
Raleigh
Salisbury
Kannapolis
Concord
Gastonia
Charlotte
Spartanburg
Rock Hill
Greenville

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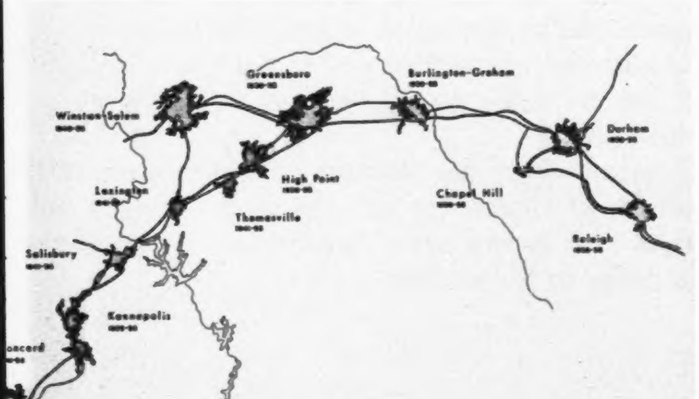

What problems arise if our metropolitan centers fuse into one long city?

The cities we live in are different, too, from the concentrated skyscraper cities which we used to build. Today's and tomorrow's cities will grow horizontally instead of vertically—they will spread out into suburbs and in some cases will fuse together.

In the Piedmont Crescent area, for instance, we find a long strip of cities fanning out along the highways between Washington and Atlanta. The Crescent is a rapidly growing area which has become urbanized relatively recently. In the past 20 years population has nearly doubled over a land area 2½ times its former size.

But the greatest period of growth is still ahead, and the University of North Carolina's Institute for Research in Social Science is doing its part to explore attitudes, forces and approaches which will be influential in making the future growth of the area an orderly and productive one.

The University's Urban Studies Program is devoted to a study of the growth potential of the Crescent and the problems which this growth might bring about. The study is focused on 16 counties in the Piedmont Industrial Crescent, stretching from Raleigh, North Carolina to Greenville, South Carolina. Part of this investigation will be devoted to the relatively new set of problems which arise when cities fuse with one another to make one long city rather than a cluster of cities separated by vacant land. The University of North Carolina's study of the ways and means of preventing chaos and educating citizens may well make the difference between a thriving industrial area or a cluster of cities competing for a marginal livelihood.

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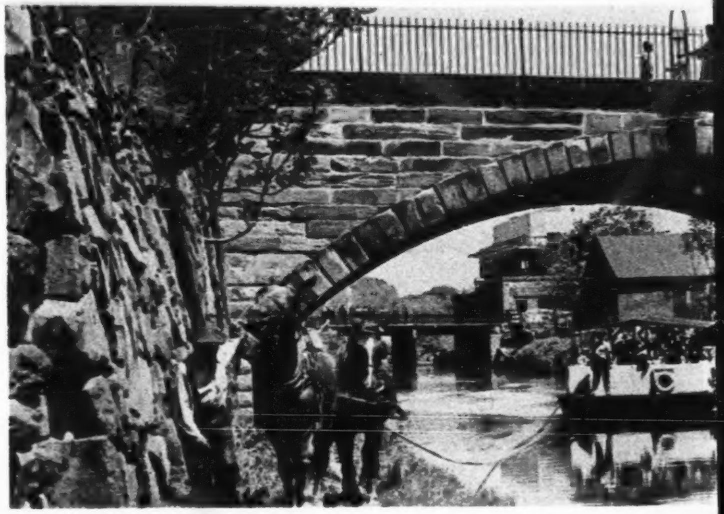
Another illustration of research designed to prevent problems was carried out at the University of Maryland's Bureau of Business and



Thirty-three miles of this historic canal would have been inundated if a dam had been constructed as proposed

Economic Research. Here a team of researchers recently completed a study of the Potomac River basin.

They have concluded that this new basin is an economic unit just as a farm is an economic unit, and that overall planning is essential to its economic health. While it is easy for a farmer to realize that he must keep his fences repaired if he wants to keep the chickens out of the garden, it is sometimes not so obvious that appropriate zoning regulations—a city's "fences"—can help to avoid congestion and deterioration of an area.

The Potomac River project has tried to point this out, and has outlined the need for more extensive research. Meanwhile, it has had immediate significance in postponing the construction of a high dam above Great Falls.

Research findings showed that the dam would provide only a small amount of expensive power at the cost of flooding valuable land and portions of the historic Chesapeake and Ohio Canal. At the same time, it would not solve the major problems of water supply, flood control, river pollution, or recreation.

These facts, brought to light by the University of Maryland's study, helped save the community many millions of dollars in capital outlay for building the dam. The community retained the large annual tax revenues from the valuable land which would have been flooded.

▼

At the University of Louisville, research at the School of Law is looking into the construction of the Watterson Expressway—its impact on the uses and value of adjacent land. The findings will be combined with those of a similar study of the Lexington area by the University of Kentucky's Bureau of Business Research.

Together these two studies of a local problem will for
knowledge which can be used for identifying and anticip
problems elsewhere.

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Sometimes research deals with problems by showing th
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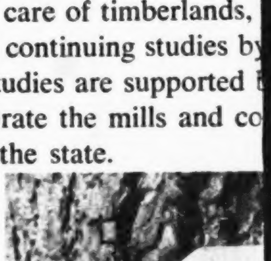

The pulp and paper industry: boon or burden to Georgia's economy?

Section 2

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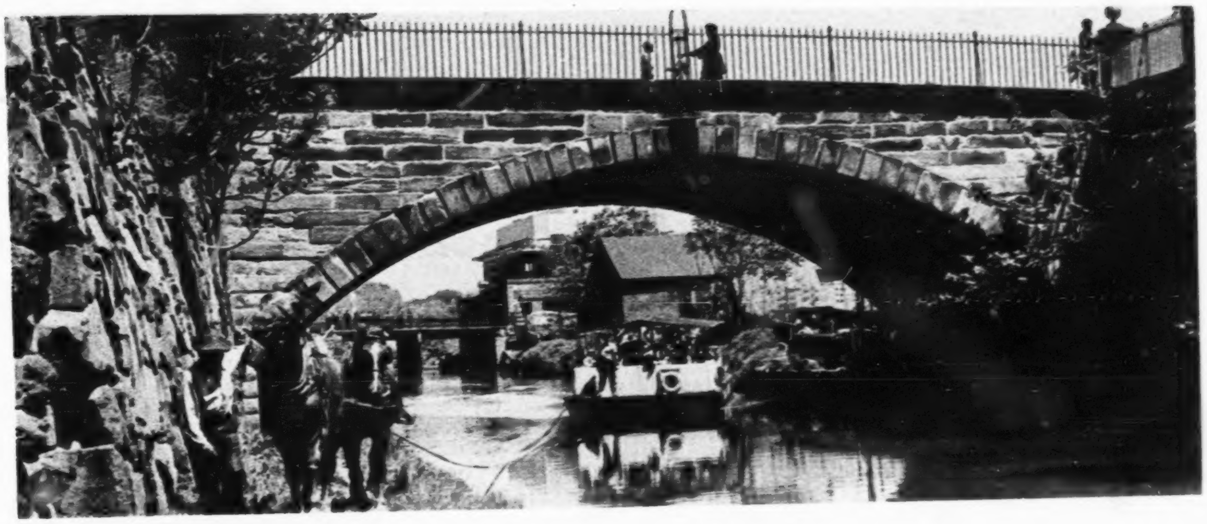


Together these two studies of a local problem will form a body of knowledge which can be used for identifying and anticipating similar problems elsewhere.

▼

Sometimes research deals with problems by showing that they really don't exist at all, as was the case in Georgia.

One of the biggest shifts in Georgia's economy has been the phenomenal growth of the pulp and paper industry. In a state which not too long ago depended on cotton alone for its livelihood, the disruptions caused by this new industry appeared to some citizens more damaging than its benefits.

An objective view of the situation was provided when the School of Business Administration at Emory University published a report entitled *The Place of the Pulp and Paper Industry in the Georgia Economy.*

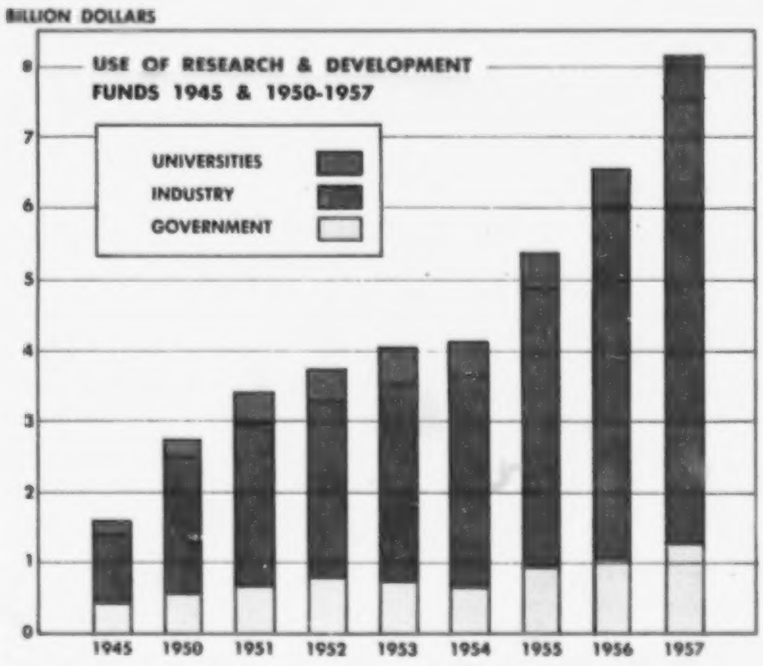
The report pointed out that the paper industry has promoted a more wholesome attitude toward forests—a trend toward conservation of woodlands rather than exploitation of forest resources.

Today forestry means systematic care of timberlands, with a modern program of state legislation and continuing studies by universities and allied business organizations. Studies are supported by the major pulp and paper companies that operate the mills and control a 357-million-dollar initial investment in the state.

The pulp and paper industry: boon or burden to Georgia's economy?

Section 1

Research is becoming more important...



The nation has found it necessary to support more and more research. Universities have done a small but extremely vital portion of it—much of it basic research which forms the groundwork for more specific applied investigations.

and each Sout
is doing a sha

MONEY SPENT FOR RESEARCH AND FOR M

STATE	Expendi (in thous
Alabama	$ 3,6
Arkansas	9
Delaware	1,0
Florida	7,0
Georgia	5,4
Kentucky	2,7
Louisiana	5,6
Maryland	25,3
Mississippi	1,5
North Carolina	7,5
Oklahoma	3,0
South Carolina	4
Tennessee	4,7
Texas	12,3
Virginia	4,0
West Virginia	1,0
Region	54,2

For every $100 of personal inc
expended on university researc
spent for memberships in gol
state differences depend large
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"Above all, increased support should be provided primarily to colleges majority of basic scientists are employed and where the advanced trai

Section 2

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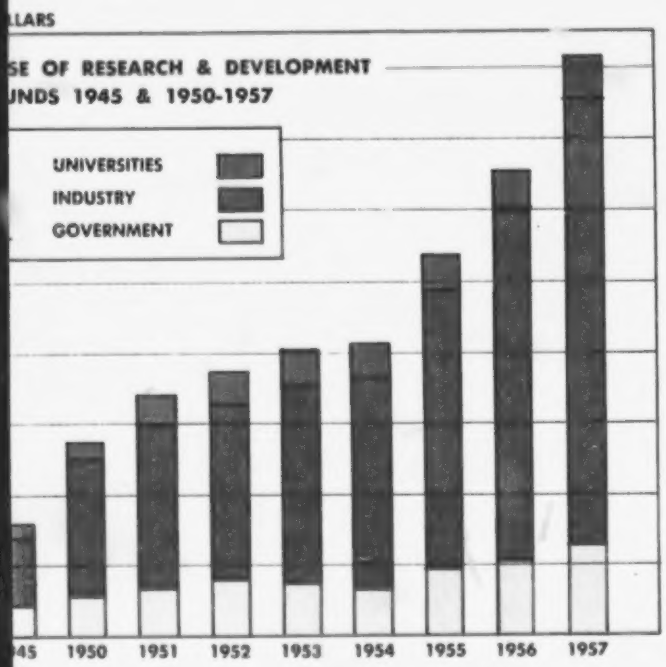


has found it necessary to support more and more research. have done a small but extremely vital portion of it—much research which forms the groundwork for more specific stigations.

and each Southern state is doing a share...

MONEY SPENT FOR RESEARCH AND FOR MEMBERSHIPS IN GOLF AND COUNTRY CLUBS

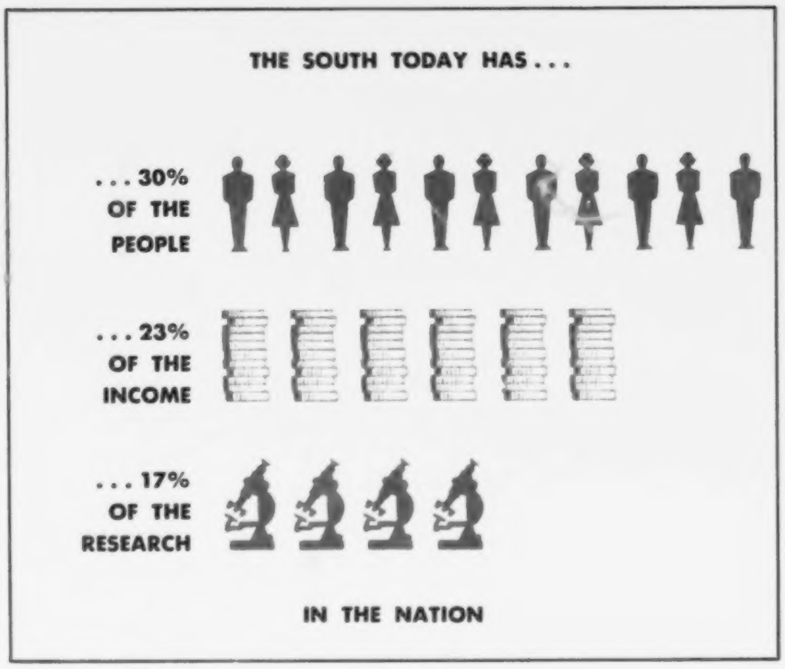
	University Research ([illegible])		
STATE	Expenditures (in thousands)	Expenditures Per $100 of Personal Income	Expenditures for Memberships in Golf and Country Clubs (in thousands)
Alabama	$ 3,640	$ .09	$ 2,260
Arkansas	931	.05	1,553
Delaware	1,042	.12	1,591
Florida	7,003	.11	7,464
Georgia	5,418	.10	5,139
Kentucky	2,777	.07	3,267
Louisiana	5,[illegible]65	.13	3,081
Maryland	25,342	.43	8,204
Mississippi	1,518	.07	778
North Carolina	7,509	.13	4,543
Oklahoma	3,026	.09	3,818
South Carolina	467	.02	1,432
Tennessee	4,730	.10	3,763
Texas	12,391	.08	15,083
Virginia	4,095	.07	8,892
West Virginia	1,034	.04	1,582
Region	54,266	.07	72,460

For every $100 of personal income in the region, 7¢ is being expended on university research! This is less than the amount spent for memberships in golf and country clubs. State by state differences depend largely on degree of outside sponsorship. For example, the heavy expenditures in Maryland reflect massive federal and foundation research support at Johns Hopkins University.

all, increased support should be provided primarily to colleges and universities, the n y of basic scientists are employed and where the advanced training of future scientist

Section 1

but the region has hardly begun to catch up



The public and private institutions of the region have given steady support to research. But the fact remains that the South's share of the nation's population is still twice as large as its share in research expenditures. More important, the region's part of the national income is consistently greater than the percent of funds spent for research.

tural habitat of basic research, where the large
and engineers takes place."—Wernher von Braun

The modern univers
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Section 2

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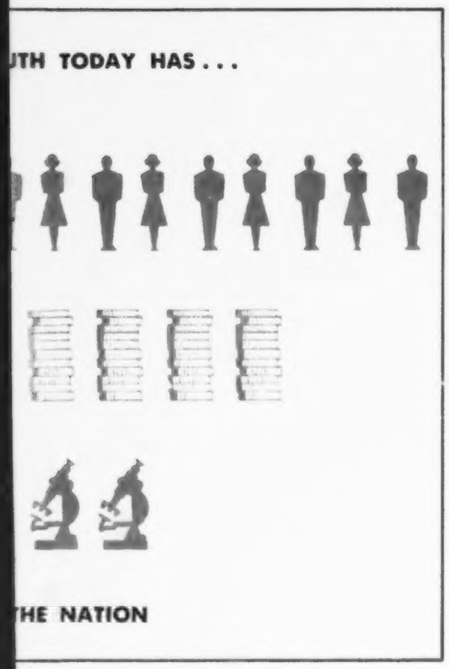

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The modern university budget strives to reflect the idea that a university must advance knowledge as well as transmit it.

At the University of Arkansas about two million dollars were budgeted this year for research. However, only about 1/10th of this amount came from the university. The remainder represents contracts and grants from the state, federal government, foundations, and industry.

Somewhat less than half of the total—about one million dollars—was allocated to the Medical Center. Of the remaining million dollars, about ¾ will be used for research in the department of Arts and Sciences, while the rest will be spent by the College of Education.

The largest single contract covers a project in nuclear chemistry in the chemistry department which was awarded the largest total of grants and contracts. Other research in the arts and sciences is in biology, botany, bacteriology, physics, government, mathematics, zoology, and city planning.

Section 1

research means **solving problems**

THROUGH RESEARCH we try to unravel pressing, here-and-now problems or those which simply arouse our curiosity. It is often hard to separate so-called applied and basic research because today's idle curiosity may lead to tomorrow's most useful discovery. Conversely, research designed to apply to a particular problem often results in basic new findings in a completely different field.

Perhaps the only generalization we can make is that no research is useless. Our civilization would come to a grinding halt the day men stopped asking "why?" and pursuing the answer.

It is also safe to say that the results of research are often unpredictable. In Georgia, for example, a local foundry wanted an economical way of making permanent molds for metal castings. The present method of molding a frying pan or an engine block requires a new mold for every unit—an expensive, cumbersome process. But the same is true of making a permanent mold of fused silica at high temperatures—it is (or was) impractical.

It was until two ceramic engineers at Georgia Tech found that molds could be made at room temperature from *ground* fused silica and that the resulting ceramic substance had characteristics which promise to make it the basis for a hundred million dollar nation-wide industry.

Because it withstands heat and heat shock so unusually well, this material is being made into nose cones which must be able to withstand the heat shock of re-entry plus that of hurtling through the atmosphere at 15,000 miles per hour.

The silica is also being made into long-lasting boiler liners on railroad locomotives, and looks promising as a rugged heat exchanger in atomic power plants.

Thus an entirely new industry has been created in Georgia as the result of one man's problem and the solution which went far beyond it.

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Section 2

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Of course, not all experiments take such a fortuitous turn. If investigation can solve the problem at hand, the researcher feels amply rewarded and justly so.

At the agricultural experiment station in the Virginia Polytechnic Institute, researchers were called upon to look into a strange new cattle disease—hyperkeratosis—which was causing annual losses up to four million dollars in 1949.

Studies showed that an additive in lubricant or grease was causing the disease. Further sleuthing revealed that grease from machines which make livestock feed contained the additive which was transferred to the cattle through the feed.

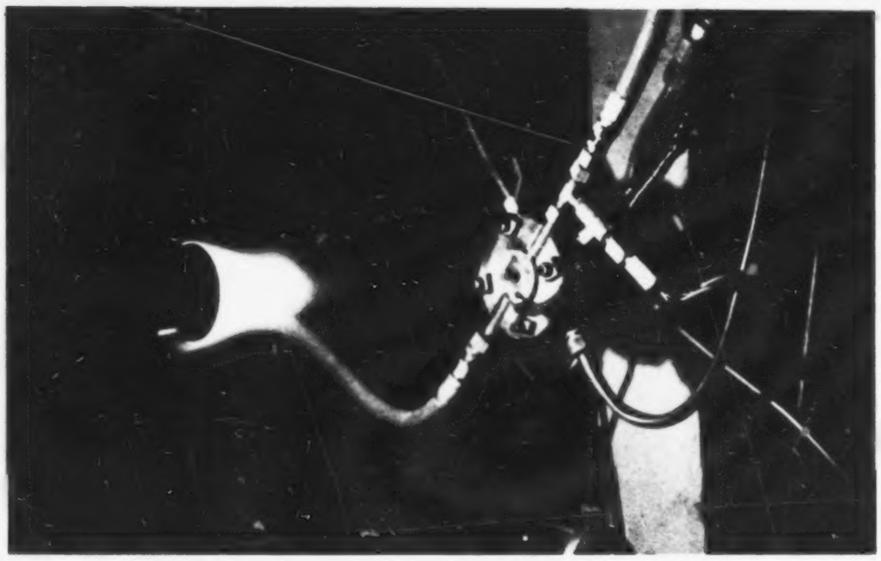
With these facts in hand, the oil companies, feed manufacturers and farmers were able to take the necessary precautions and to wipe out the disease entirely.

On the Gulf Coast of Florida, the sight of thousands of dead fish on the beaches was a distressingly familiar one, much to the despair of commercial fishermen and Floridians who depend on the tourist trade. The "Red Tide" responsible for this carnage is caused by concentrations of a microscopic brownish-red form of marine life which exude a poison fatal to fish.

The cause of the Red Tide was discovered by the University of Miami's Marine Laboratory which is now working on ways to control it. Although these microscopic killers can be killed by chemical treatment, their control is difficult because they are present in all salt water.

However, through studies of currents and other factors, the university researchers have learned to predict and control the spread of the Red Tide to some extent and have substantially reduced its harmful effects on fishing and the tourist trade.

Section 1


The miniature jet engine at right warms up the nose cone at left to a glowing 5,000 degrees, simulating the heat generated by air friction as a missile speeds through the earth's atmosphere

A cynic has said that research is basic "when you don't know what you're doing." But perhaps a better definition of basic research is that it is a step from the known to the unknown.

Several years ago animal pathologists at West Virginia University noticed an unknown disease in poultry while they were investigating the causes and cure of poultry hemorrhages. Being scientists, they felt obliged to investigate the new disease, gave it a name (infectious synovitis), determined how it was transmitted, and developed means of prevention and treatment.

All this happened at an auspicious moment, for the disease suddenly became wide-spread just as methods for controlling it were perfected. It is estimated that this research meant a saving of one and a third million dollars a year to the broiler industry.

▼

Knowledge gained by research in one field is often applicable to another very different field. Thus petroleum engineers at the University of Oklahoma are studying the replacement of oxygen in blood during heart surgery, while biologists at the University of Houston have been investigating spoilage in cutting oil.

High speed drills require coolants to prevent their
from bending like putty. A mixture of lard, oils, soap a
proven to be a very satisfactory coolant except for one
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It is possible to aerate the blood by making it flow in
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What kind of material would make this possible? A
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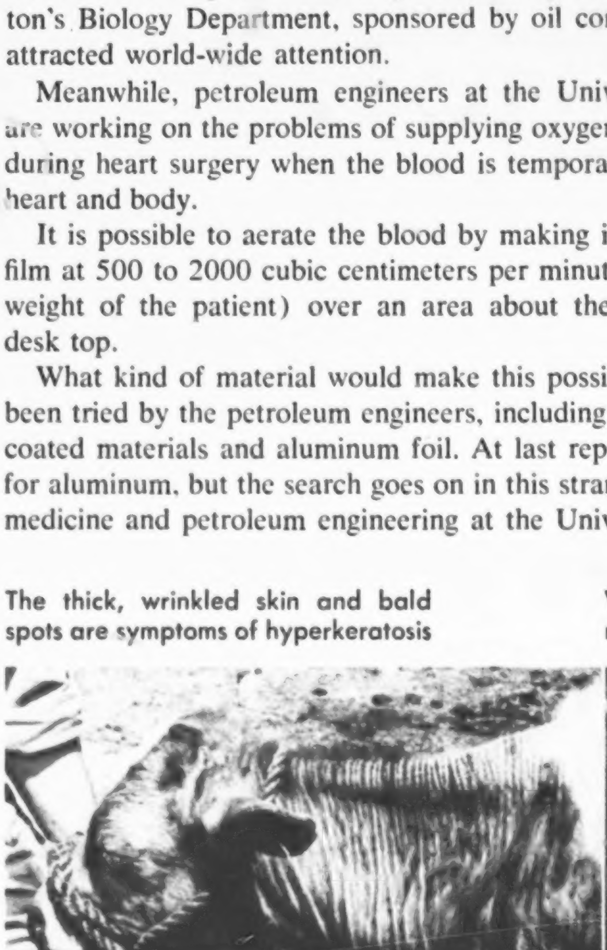
The thick, wrinkled skin and bald spots are symptoms of hyperkeratosis



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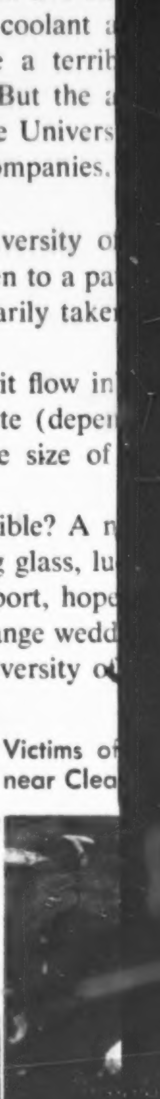
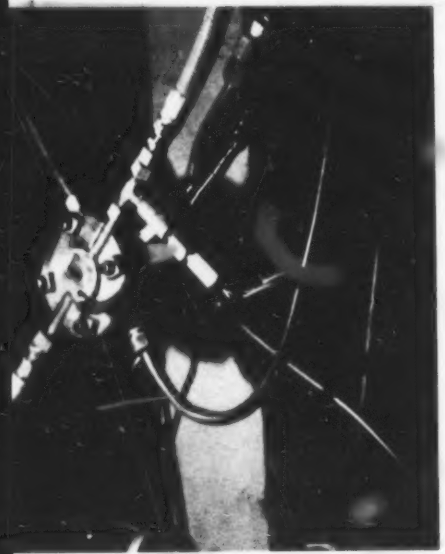


Section 2



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High speed drills require coolants to prevent their cutting edges from bending like putty. A mixture of lard, oils, soap and water has proven to be a very satisfactory coolant except for one drawback: it spoils after a while and must be flushed out with live steam.

Besides the waste of two billion gallons of coolant annually, the bacteria which cause this spoilage also cause a terrible waste of manhours involved in the cleaning operation. But the antidote may not be far off—problem-solving research by the University of Houston's Biology Department, sponsored by oil companies, has already attracted world-wide attention.

Meanwhile, petroleum engineers at the University of Oklahoma are working on the problems of supplying oxygen to a patient's blood during heart surgery when the blood is temporarily taken out of the heart and body.

It is possible to aerate the blood by making it flow in a very thin film at 500 to 2000 cubic centimeters per minute (depending on the weight of the patient) over an area about the size of an average desk top.

What kind of material would make this possible? A number have been tried by the petroleum engineers, including glass, lucites, plastic coated materials and aluminum foil. At last report, hopes were high for aluminum, but the search goes on in this strange wedding between medicine and petroleum engineering at the University of Oklahoma.

The thick, wrinkled skin and bald spots are symptoms of hyperkeratosis

Victims of the Red Tide near Clearwater, Florida

Section 1

research means **great universities**

Johns Hopkins University, the first in the country to offer graduate education

How does a university achieve recognition? Why is it people have heard of one university and not another? The answer is not necessarily football. More often it's a distinguished faculty, a good library, and the other resources which make up the breeding ground for research.

Southern educators have been alarmed for some time by the fact that such a large proportion of top students—those who win scholarships and fellowships in national competitions—choose to attend universities outside the Southern region. After they graduate, some of them will not return to the South to work, and in this way the region loses some of its most promising young people.

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These industrial leaders have att
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Most of the University's nuclear
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Section 2

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This is even more true of superior faculty members, whose preference for a university depends heavily on an institution's research vitality. Whether or not they remain will often be decided by the richness and variety of research opportunities.

We can cite only a few of the many examples of research recognition at Southern universities.

Oklahoma State University's College of Engineering, for instance, has achieved an international reputation for work on the mathematics of electromagnetic relay operations.

Relays have been used for many years in automobiles, telephones, elevators and vending machines. But recently, automation and other aspects of our advancing technology have put new demands on them —relays in missiles and airplanes, for example.

Through the work of its engineering department, Oklahoma State University has won recognition from the several billion dollar relay manufacturing industry.

These industrial leaders have attended every year for the past six years a national relay symposium held on the Oklahoma campus which the National Association of Relay Manufacturers has helped sponsor since 1956.

◆

The University of Virginia is one of several Southern institutions whose atomic research has attracted a great deal of attention from industry, the armed forces and the general public.

Most of the University's nuclear energy research has been basic research, but much of it has industrial application. Besides the Atomic Information Center for the general public, the university is conducting research on nuclear agriculture, nuclear medicine and nuclear engineering, to name only a few areas.

Section 1

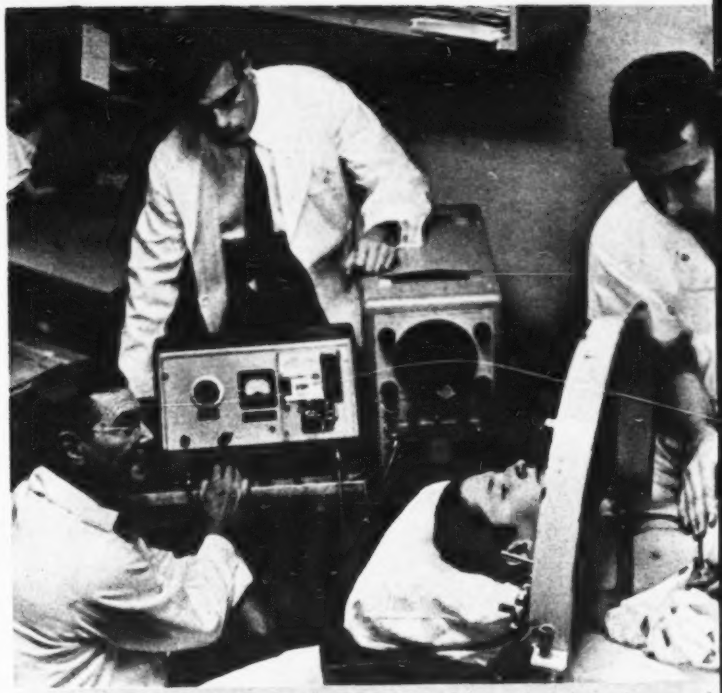
The Engineering School, for example, is working with an atomic energy equipment industry which has already built an atomic energy plant in Lynchburg—the same concern which recently supplied a reactor to power the nuclear merchant ship "Savannah."

While this kind of research brings recognition to Southern universities, the larger significance of atomic research lies in its impact on the South's economy. Weight for weight, uranium is two million eight hundred thousand times more productive of energy than coal.

▼

At Vanderbilt University a scientist working in anatomy and pediatrics received international acclaim a short time ago when he presented a paper on an electronically controlled respirator to the International Conference on Medical Electronics.

The outstanding success of "Project Farside" brought personal congratulations from President Eisenhower to the University of Maryland physicist responsible for the design of the rocket's delicate instrument pay load. Shown above are students working on the instruments placed in this rocket which put the first U. S. satellite into orbit



A polio patient finds new breathing freedom in an el ally-controlled iron lung

This research has resulted in, among other things, which breathes according to the patient's need for air, arbitrarily determined rhythm.

Electronic controls strapped to the polio patient's chest to the tiny electrical currents generated by the par muscles. These currents indicate when the patient wou breathe if his muscles were able to do so. The electrical received are used to trigger the motor of the iron lung.

Perhaps the most coveted level of recognition ente the gratitude of the polio patient whose life has beco more bearable, thanks to research.

Section 2

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A polio patient finds new breathing freedom in an electronically-controlled iron lung

This research has resulted in, among other things, an iron lung which breathes according to the patient's need for air, instead of an arbitrarily determined rhythm.

Electronic controls strapped to the polio patient's chest are sensitive to the tiny electrical currents generated by the paralyzed chest muscles. These currents indicate when the patient would ordinarily breathe if his muscles were able to do so. The electrical impulses thus received are used to trigger the motor of the iron lung.

Perhaps the most coveted level of recognition enters in here—the gratitude of the polio patient whose life has become so much more bearable, thanks to research.

Section 1

research means **healt**

GOOD FOOD, pure water and peace of mind might be considered basic essentials for good health. Southern universities are doing research in all three areas to ensure the well-being of people in the region and throughout the world.

In 1941, when pellagra was still causing hundreds of deaths in South Carolina, the Department of Nutrition at Clemson College began working with a state committee on legislation requiring that all bread, flour and margarine be enriched with the vitamins which were lost in processing these foods. South Carolina thus became the first state in the nation to enact enrichment laws.

But work remained to be done in restoring the food value of corn and rice products. Here again, Clemson College perfected a method of putting vitamins and iron back into corn so that in 1943 a law requiring the enrichment of corn meal and grits was on the South Carolina books. In 1956, a way of enriching rice was discovered at Clemson and written into the laws—another South Carolina first.

Today, 28 states have passed enrichment laws similar to the one which South Carolina enacted in 1942. Voluntary compliance in the remaining states has meant that by now 80% of the flour and bread in the United States is enriched, as is 70% of the corn meal in the South.

More recently, Clemson nutritionists have developed portable enrichment equipment to make it easier for local millers in rural areas to fortify their grain. The resulting food provides, in many cases, even more vitamins and minerals than are found in the natural grains. Today, death from pellagra is a rarity.

Vitamins (or lack of them) have been a health problem in the Southeast. The Southwest, on the other hand, has been concerned with getting enough good fresh water for human consumption, manufacturing and industry. At North Texas State College, a great deal of research time is devoted to investigati
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Faculty members in the Biology D
this area, often doing joint resear
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Thousands of South Carolina hom
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IMPROVED NUTRITION, QUALITY AN
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1 Do Not Wash Bef
2 Use Accurate P
3 Do Not Drain
RICE ENRIC
Increases Nutriti
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Cooks, Looks, And Tast
METHODS of COOKING

Section 2

research means **healthy people**

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Faculty members in the Biology Department have been working in this area, often doing joint research with the Bureau of Reclamation and the U. S. Public Health Service. The aim of their efforts

Thousands of South Carolina homemakers who saw this exhibit changed to the easier, more nutritious way of preparing rice

IMPROVED NUTRITION. QUALITY AND USES THROUGH RESEARCH
SAVE TIME
GAIN BENEFITS
COOK RICE CORRECTLY
1 Do Not Wash Before Cooking
2 Use Accurate Proportions
3 Do Not Drain - Rinse After Cooking
RICE ENRICHMENT
Increases Nutritional Value
Costs Less Than A Penny For A 5 Bag
Cooks, Looks, And Tastes The Same
IMPROVED NUTRITION

Section 1

is to find the most practical ways of making adequate amounts of good water available for the growing needs of the people of the South and Southwest.

▼

While each man must do his own "research" to achieve peace of mind, approximately one out of every ten people will need professional help with mental and emotional problems some time in their lives. Shock therapy has become a widely-used treatment, and researchers at the University of Maryland's Department of Pharmacology have discovered a method of administering it which has already proved more effective than the standard methods in many cases.

A gas called Indoklon has been used in more than 1500 cases requiring shock therapy and has been found to be more controllable than insulin or elektro-shock. In fact, its effect can be instantly reversed by the administration of oxygen. Continued experimentation may show even more conclusively that Indoklon is a significant step forward in better treatment for the mentally ill.

Investigators at the University of Oklahoma are learning more about histoplasmosis, a lung disease frequently confused with tuberculosis

Section 2

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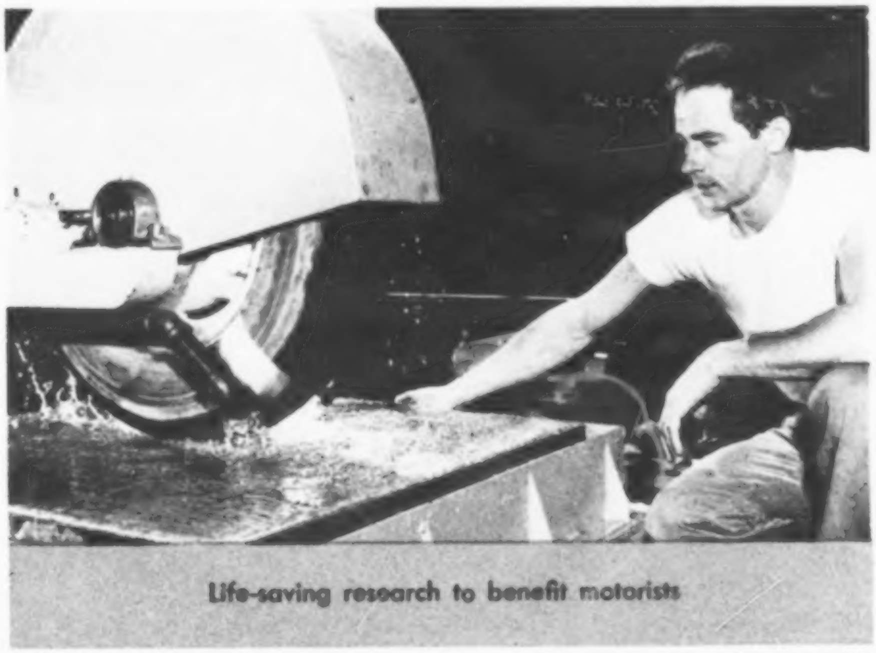
Section 1

research means **saving lives**

While the doctor is traditionally associated with saving lives, research done by engineers, veterinarians and even educators in Southern institutions is contributing toward making life safer and longer.

At the University of Tennessee, an automobile tire is skidding night and day on a sample of water-soaked pavement to give highway engineers a chance to test different types of pavements for skid-resistance.

This skid machine will short cut by many years the slow, unreliable process of making tests on the road. It is only one example of research programs at Southern institutions designed to reduce the alarming death toll on our highways.



Life-saving research to benefit motorists

George Peabody College for T
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A manual will be compiled by
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And of course medical schools
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Section 2

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George Peabody College for Teachers is under contract to the Office of Civil and Defense Mobilization to work on a project entitled "Education in a Time of Threatened Disaster." Its purpose is to prepare teachers to deal with emergencies caused by natural disasters or enemy attack.

A manual will be compiled by the ten faculty members studying the many aspects of this problem. Copies will then go to every teacher training institution in the United States with the endorsement of the Office of Civil and Defense Mobilization.

* * *

Animal lives are not only precious in themselves but often offer clues to diseases troubling their human masters. Bacteriologists at the Alabama Polytechnic Institute's Veterinary School are currently studying peritonitis in dogs to determine the causes and cure of the disease.

And of course medical schools offer countless examples of lifesaving research. In 1952, researchers at the Medical College of Virginia found a reliable method of minimizing shock in the severely burned patient.

Basically, shock is caused when fluid from the bloodstream rushes to the burn and depletes the fluid supply of the blood. While this fluid can be replaced, the problem has always been to estimate accurately the amount of fluid the patient will need.

After many experiments, investigators at the Medical College of Virginia devised the Evans formula which predicts the type and amount of fluid a severely burned person needs during the first 48 hours of treatment. The formula has received national and international attention and is now widely used in the treatment of serious burns.

Section 1

Research to benefit anim

At the Medical College of
the fatality

Section 2

Research to benefit animals as well as their human masters

At the Medical College of Virginia, research has minimized the fatality of serious burns

Section 1

research means **a vigorous economy**

The use of ammonia fertilizer, so successful in Mississippi, has spread throughout the country

AS A 19TH CENTURY SCIENTIST pu
what you are speaking about, when
your knowledge is of a meager anc

Most of us are aware that it take
a disease or sail a ship. But the
have not received as much publici

Today the economist can measu
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With this information in hand,
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Section 2

rch means **a vigorous economy**

of ammonia fertilizer, so successful in Mississippi, has spread throughout the country

As a 19th century scientist put it, "When you cannot measure what you are speaking about, when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind."

Most of us are aware that it takes tools of measurement to diagnose a disease or sail a ship. But the measuring rods of the economist have not received as much publicity.

Today the economist can measure our production and consumption, our income and our expenditures with such precision and sensitivity that many economists feel we will never again have a 1930's type of depression—we will see it coming and do something about it before it's too late.

Oddly enough, though, economists have found it easier to keep their fingers on the economic pulse of the entire nation than to systematically measure the economic health of counties or states. Universities in the South have played an important part in helping to develop scientific methods of measuring county income.

In 1939, a pioneering effort in this direction took place at the University of Alabama. By 1952, seven Southeastern states pooled their knowledge in this field at a conference, this time at the University of Kentucky.

Today, the state university often has a central role in furnishing periodic estimates of county income through its bureau of business research. Work at the University of Virginia illustrates how county income may be measured periodically in order to gauge the vitality, stability or decline of the economy in various parts of the state. Particular attention is given to sources of income and its distribution so that estimates can be made of the prospects of future growth.

With this information in hand, a county or state can plan more intelligently ways of making its economy more dynamic.

Section 1

Coastal Bermuda Grass, a new forage plant, has won the approval of these consumers

U S Negro Purchasing Power 1939
30% of
50%
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Negro
White
Negro
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$956
$1,868
-5% of
33% Own Their Homes
In Nashville Negroes
12% of the Purchasing Power

Studies of growing Negro buying power are encouraging new

But research can do more than measure economic health—it can promote economic growth through a wide range of activities, such as one at the Mississippi State University's Agricultural Experiment Station.

The station's work with anhydrous ammonia showed how nitrogen could be applied directly as a fertilizer. Industry moved into production of the new material without delay, building three large fertilizer plants and several smaller ones—a total investment of approximately 25 million dollars.

The plants provide employment for hundreds of workers, substantial dividends to shareholders, and furnish farmers with the nitrogen they need at a reasonable cost.

It is estimated that Mississippi farmers have saved as much as three million dollars on their fertilizer bills in a single year. The use of anhydrous ammonia has spread across the nation and to many other countries.

Research at the University of Georgia promises to bri
tially new industry to parts of the Southern region. At the
Coastal Plain Experiment Station in Tifton, a new, sup
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Section 2

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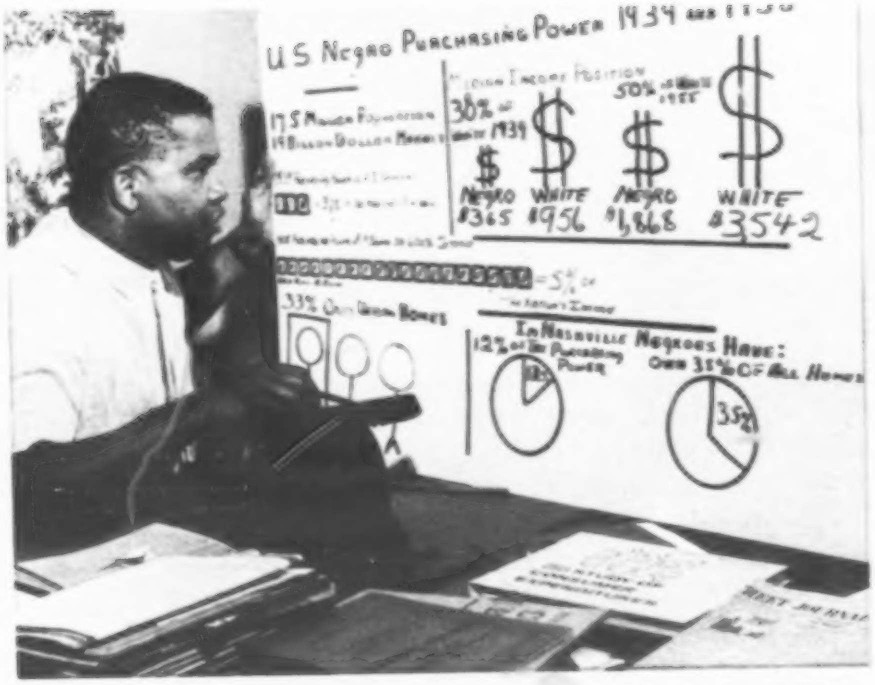
U S Negro Purchasing Power 1939 and 1956
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33% Own Homes
In Nashville Negroes Have:
12% of the Purchasing Power
Own 35% of All Homes
35%

Studies of growing Negro buying power are [illegible]uraging news to retailers

Research at the University of Georgia promises to bring an essentially new industry to parts of the Southern region. At the University's Coastal Plain Experiment Station in Tifton, a new, superior forage plant—Coastal Bermuda Grass—has been developed. It has been shown that this grass, when dehydrated, ground and pelleted, is equivalent to alfalfa as feed for growing young beef steers.

Widespread use of Coastal Bermuda Grass, which thrives in the Southeastern part of the country, could mean that the region may become the major beef-producing area of the nation.

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The consumer is, of course, a basic ingredient of a healthy economy and research at Fisk University promises to shed new light on the Negro market for goods and services.

As an extension of Fisk's research in the field of race relations, studies are now being made of the Negro's economic resources, his buying habits, and his ability to purchase the products of industry.

Section 1

research means **wider horizons**

ALTHOUGH RESEARCH is generally associated with the laboratory or the ivory tower, in actual practice it is often carried on high up in the sky or deep below the surface of a river, giving us a better grasp of what goes on beyond the horizons we see.

Meteorologists at Florida State University have taken their instruments into the very center of hurricanes in order to learn more about their structure and behavior. In cooperation with the U. S. Weather Bureau's National Hurricane Research project, they have flown Air Force planes into Gulf and Caribbean storms in the hope of gathering enough information to understand them and possibly eventually to control them.

If control of weather is not yet a reality, the inhabitants of Bryan, Texas can verify the fact that prediction of storms is a step in that direction. Several years ago, the Departments of Oceanography and Meteorology at Texas A & M College predicted the path of a tornado by radar for the first time in weather history.

On April 5, 1956, at 1:45 p.m., a radar observer at the College Radar Weather Station noticed the first indication of a tornado about 60 miles west of Bryan. By 2 p.m. a team of college scientists had discovered, through routine tracking procedures, that the tornado was headed toward the city and would hit at 3:15 p.m.

An alert was phoned to police, schools, civil defense, and public utilities which immediately took steps to evacuate people from the danger area. By the time the tornado struck, only two minutes later than the predicted time, the town of Bryan was so well prepared that not a single life was lost during the destructive storm.

The Texas Radar Tornado Warning network is now operating 21 stations which can give any part of the state from 30 minutes to four hours of warning before a storm.

Inside the eye of a hurricane, me
in search of weath

Section 2

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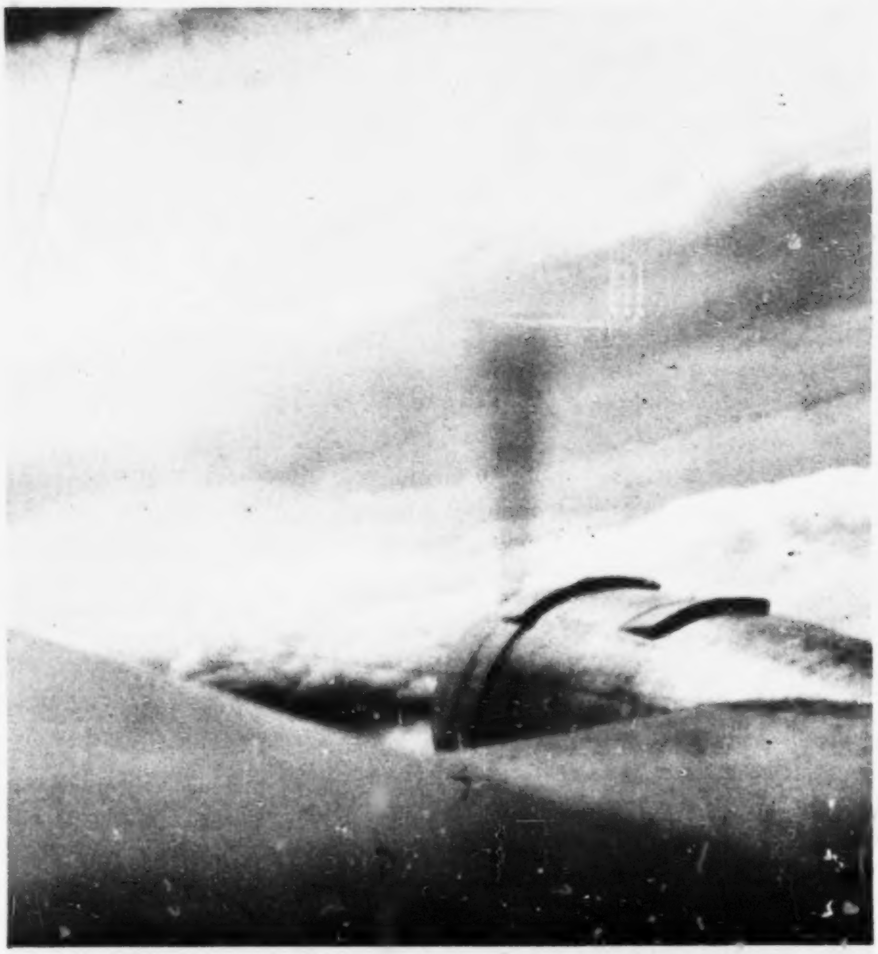

Inside the eye of a hurricane, meteorologists fly at 10,000 feet in search of weather information

Section 1

At Johns Hopkins, university researchers are plumbing the depths of Chesapeake Bay in order to study, among other things, its salt content, temperatures at various levels, and variations in oxygen content. The research, conducted through the Chesapeake Bay Institute, is largely basic although it is perhaps best illustrated by one immediate application.

Although the temperature of the bay at different depths, measured by a bathy-thermograph, was first observed only as a matter of academic interest, this information was extremely useful to the builders of the 40-million-dollar Chesapeake Bay Bridge.

Since 35 degrees is the safe minimum for pouring concrete, it was useful to know during freezing weather that the water temperature was well above 35 degrees 20 feet beneath the surface.

The Johns Hopkins researchers have noted in other investigations that the water on one side of the James River is saltier than on the other—a fact which is interesting in itself but also significant because of the questions it raises.

For example, what differences are there in the vigor of fish or plant life on different banks of the river? How can the differences in salt content be related to the currents of fresh and salt water, tidal push and pull, and even the rotation of the earth?

Basic studies of the Chesapeake waters will pay unforeseen dividends for many years to come because Johns Hopkins investigators have been encouraged to give their imaginations free rein.

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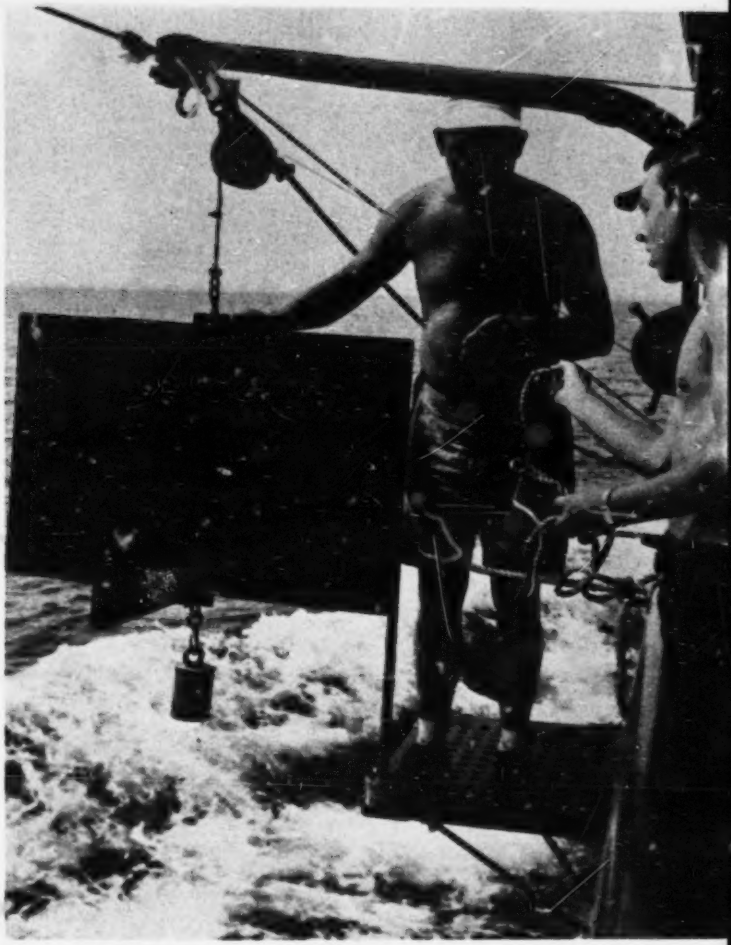
Baylor University's Department of Biology is pushing back still another frontier of knowledge. The National Institute of Algae and Infectious Diseases is interested in exploring the harmful effects of



A current-measuring device probes the waters of the Ch

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With that in mind, researchers are on the lookout for
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Section 2

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A current-measuring device probes the waters of the Chesapeake Bay

certain poisonous pond scums in order to develop antibodies. But the biologists are also interested in knowing for which fish or animals these plentiful algae are going to serve as food.

As a matter of fact, the algae may some day be food for man. The population of the world in 1859 was barely a billion. It has trebled since then. A hundred years from now scientists estimate there will be 10 billion mouths to feed. The population of the United States will then be equal to the 1859 population of the world.

With that [illegible] mind, researchers are on the lookout for new sources of nourishment—even blue-green algae which are now poisonous.

Section 1

research means **learning**

STUDENTS ATTEND universities to learn. How, then, does research fit into the picture? Why should research be considered an essential part of university education?

At the beginning of his college career, a student is taught largely by lecture and discussion methods. As he progresses through undergraduate school, he is gradually weaned away from his dependence on the professor and is expected to assume increasingly greater responsibility for his education.

By the time the student gets to graduate school, research in laboratory and library is the prevailing method of learning.

This does not imply, however, that the professor's relationship with the student diminishes to the vanishing point. Quite the contrary—the student begins to feel the exhilaration of working alongside the professor in the graduate seminar. In this give-and-take situation, the professor may well be learning from the student at the same time that he is guiding and working with him.

This atmosphere of inquiry is stimulating for both student and professor, and it is one of the reasons why the scientist is attracted to the university. He knows it provides the atmosphere in which he may continue to learn, and in which he may become a more vital teacher.

"Teachers who are investigators," says physiologist W. B. Cannon in *The Way of An Investigator,* "filled with an ardor for discovery and acquainted with ways to nature's hidden secrets, arouse in young men the qualities they themselves possess."

These teachers are not only attracted by this research atmosphere but they perpetuate it. A sociologist has put it this way: "The training of new scientists involves more than the teaching of theories and techniques . . . It is also a process of subtle moral indoctrination in the values of science."

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A university cannot sit back and rely on what is already known. It must not only keep up with new developments but be one step ahead of them—to originate the philosophical ideas or physical laws which will prepare its students for the future.

A university and its faculty must learn as well as teach in order to serve its students and society in full measure.

▼

Examples of joint research by students and their professors are legion. A recent headline in a January 1959 paper reads: "University of Tennessee given patent for new invention by science student." The invention was a method of transferring dangerous chemicals rapidly from one container to another. It was the work of a senior in chemistry and his professor.

Two weeks later, the U. T. news bureau reported that a physics professor and one of his graduate students had constructed a giant microscope to track tiny particles of nuclear explosions. Similar examples are found at almost every institution.

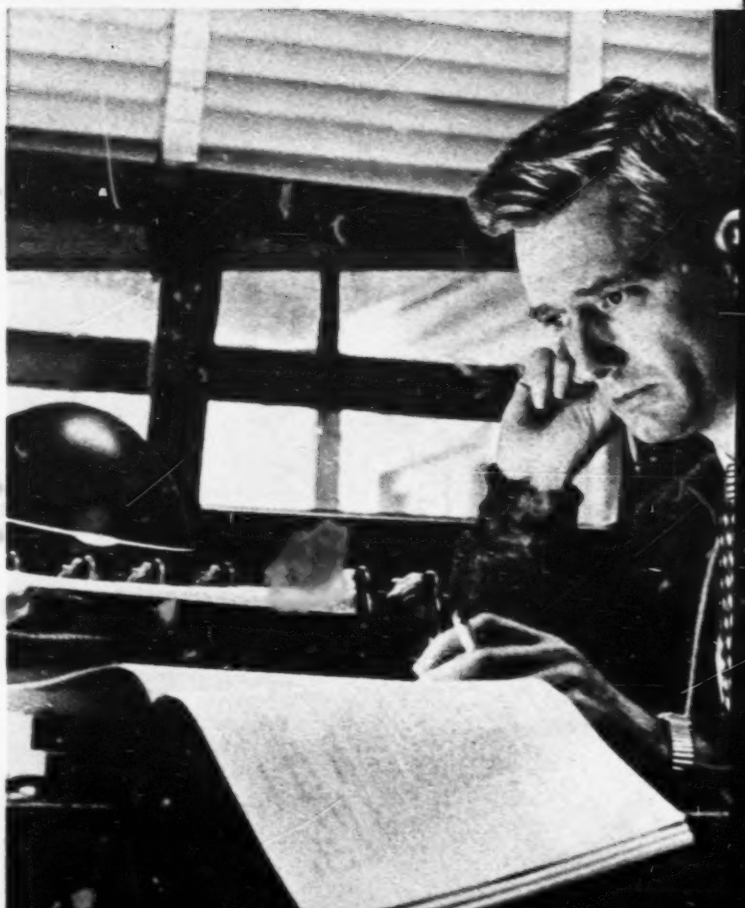
Medical schools are another illustration of the partnership between learning and research. We are not satisfied to have our medical students exposed to a faculty which will merely stuff information into a student's head. Realizing the responsibilities which a physician faces every working day of his life, medical schools prepare him with a curriculum divided into three phases: teaching, clinical work, and research.

At the Duke University Medical Center, the faculty is an example to the students in pursuing new knowledge. Last winter, Duke doctors performed surgery on a patient whose temperature had been lowered to 41 degrees Fahrenheit. At such temperatures, the heart

Section 1

stops beating and the body requires virtually no oxygen, thus simplifying certain operations and increasing the patient's safety. This major innovation, of particular value in open-heart surgery, had been preceded by more than 350 animal experiments.

Duke also made medical history recently by grafting skin which had been preserved for 1,480 days in a "skin bank." Research activity of this kind does not go unrecognized. Duke's program of cancer research has prompted the U. S. Public Health Service to award the Medical Center a million and a half dollar grant to study viruses as a possible cause of cancer. This eight-year grant reflects the confidence which Duke's research program has inspired.



Section 2

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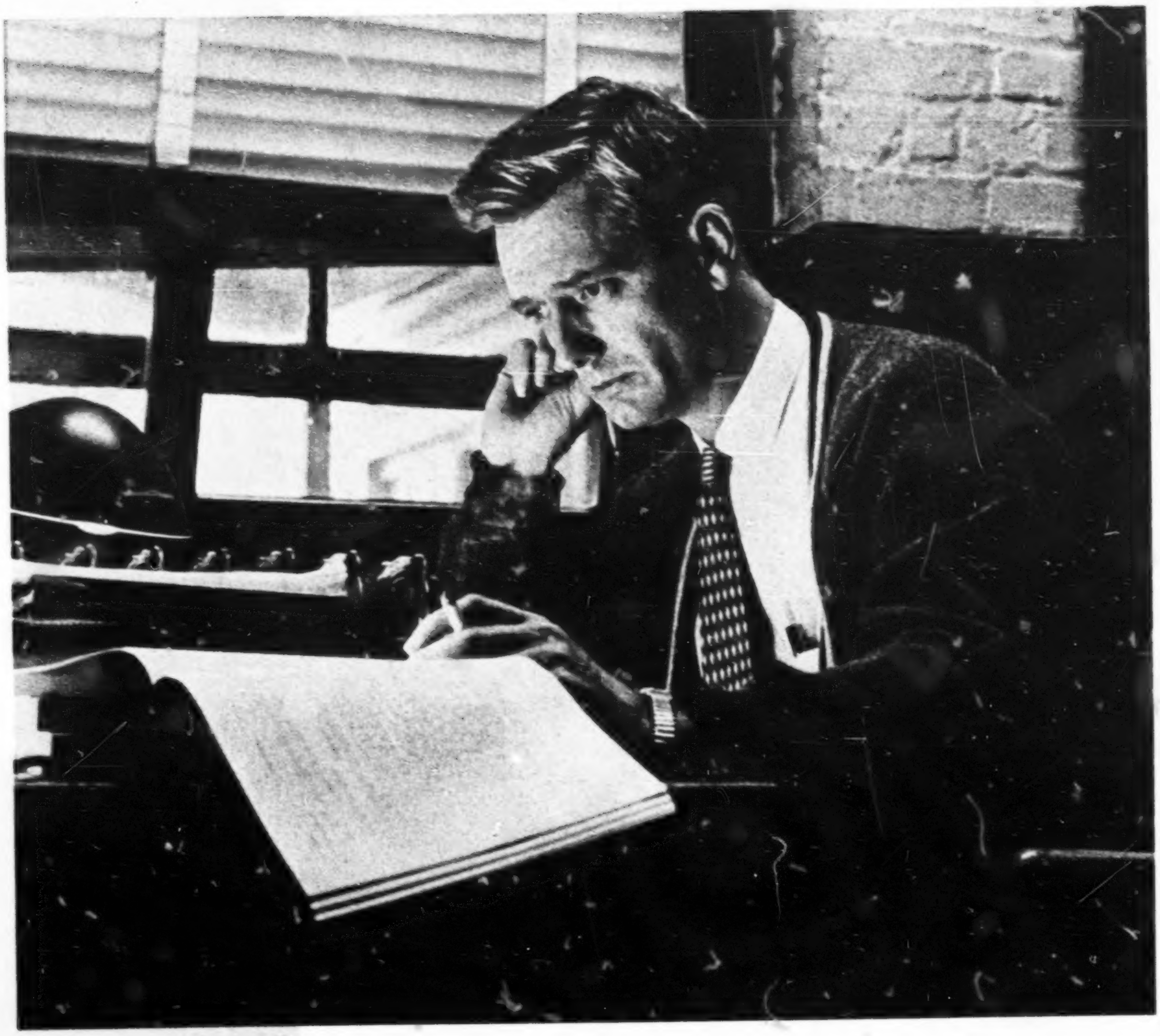
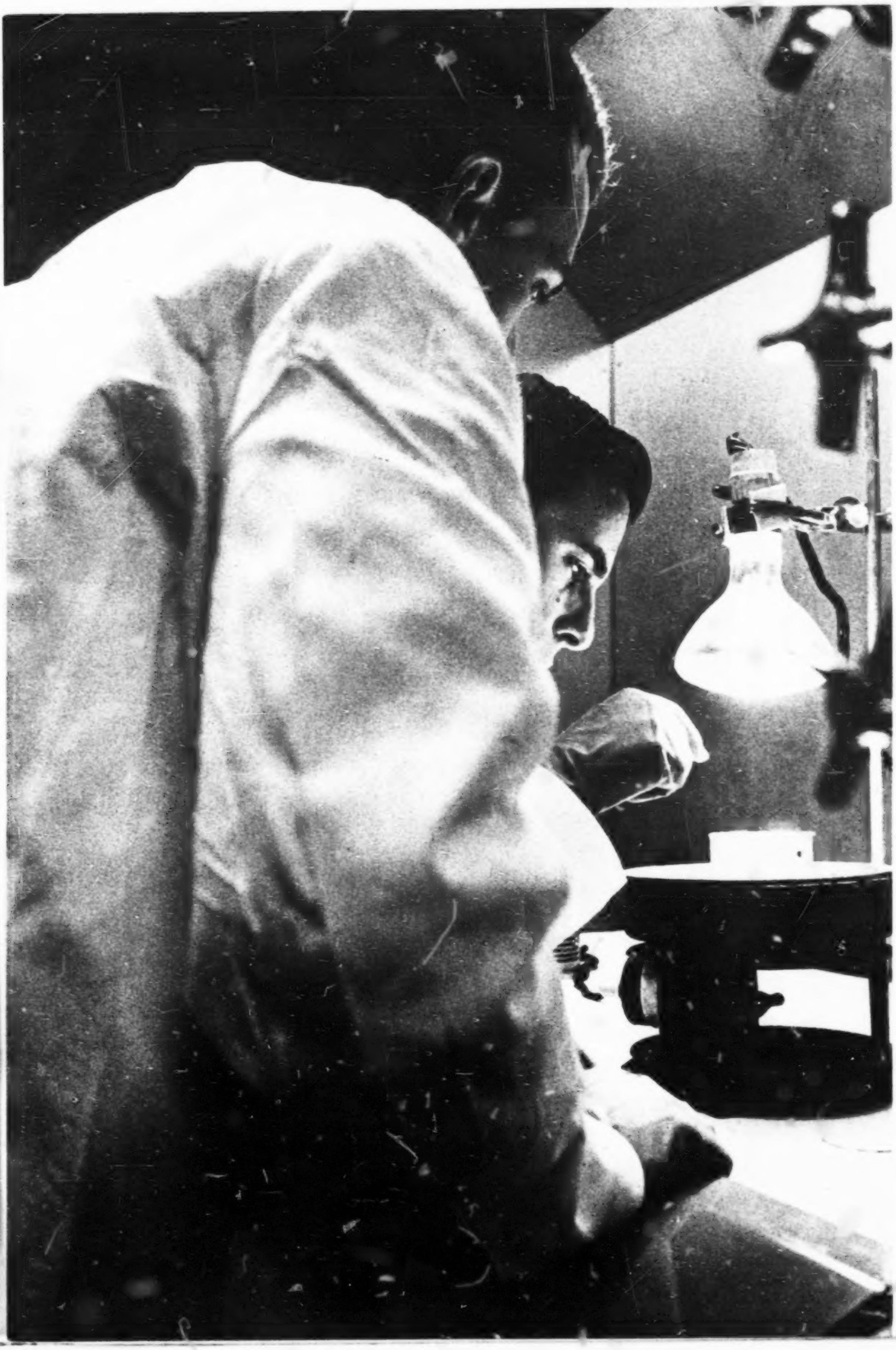


Section 1



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Section 2

THESE STUDENTS represent a new generation, a new age, and most of all, a new South. They are the type of young men the late Governor J. Melville Broughton of North Carolina had in mind when he said about the South, "At long last we are beginning to substitute the research laboratory for the wailing wall."

Research occupies a prominent place in their education and that of thousands of others like them in Southern universities. Much depends on the region's ability to continue this search for knowledge and to provide even more opportunities for it.

The examples of research in this booklet have shown us what this search means to every person in the fast-growing South. Our task now is to re-invest in the future some of the prosperity which science and education have created for us today.

But even more important than financial support is a strong faith that basic research—fundamental studies which may not show dramatic results for years—will eventually lead us to breakthroughs from the known to the unknown. We must realize that we know only a small part of the universe and understand very little about the part we do know.

One of our missile experts cautions that "for years we have been talking too much about hardware and too little about filling the vat of knowledge. We have been taking from that vat for years and putting little or nothing back in. Now we are scraping the bottom."

Fortunately the South has the raw materials for progress: students, faculty, and schools to help replenish the dwindling supply of basic knowledge.

It is up to us to determine how much of this raw material will be mined and used to fashion the plowshares of progress.

Section 1

The Southern Regional Education Board wishes to thank the following universities and organizati
furnishing the information and photographs which made the publication of this booklet possible:

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Department of Agriculture • Vanderbilt University • Medical College of Virginia • Uni
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on and photographs which made the publication of this booklet possible:

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versity • Emory University • Fisk University •
sity • University of Florida • George Peabody
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